CHICAGO NATURAL HISTORY MUSEUM

Bulletin

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SHOUT
SHARE
IT

BERTRAM G. WOODLAND
Curator of Igneous and Metamorphic Petrology

This month's featured exhibit *includes the miniature diorama of a typical valley (or mountain) glacier shown at left. Adjacent exhibits in Hall 34 show the differences between such glaciers and ice sheets, give their locations around the globe, illustrate their features, and explain their origins, movements, and effects upon the earth's surface.*

This month's cover *is an oblique aerial view overlooking Queen Alexandra Range, Antarctica. Part of Beardmore Glacier is shown. This official U. S. Navy photograph was taken by photo-mapping planes at an altitude of 20,000 feet. (Photograph courtesy of Richard Lewis.)*

GLACIERS

At this time of year it seems appropriate to turn our thoughts to snow and ice, and to glaciers and ice sheets. Mountain glaciers such as those in the Alps or on Mount Rainier, Washington, have long been known and studied, while our knowledge of the vast ice expanses of Greenland and Antarctica has been greatly increased during the last dozen or so years. The International Geophysical Year, 1957–58, provided a special impetus to the exploration and scientific study of Antarctica.

It is now known that glaciers and ice sheets cover between 5¾ and 6 million square miles, or about one-tenth of the total land surface of the world. Antarctica accounts for by far the largest proportion—nearly 4½ million square miles, not including more than ¾ million square miles of shelf ice which, although an extension of the ice sheet, is actually floating on the sea. Greenland is very largely buried beneath more than 600,000 square miles of ice. The remainder of the world's glaciers is comprised of very much smaller areas such as those of Baffin and Ellesmere Islands, Alaska, Spitsbergen, Iceland, and the mountain glaciers of Asia, New Zealand, South America, Norway, and the Alps. Where the mountains are sufficiently lofty, glaciers are even found near the equator such as on Mount Kilimanjaro in Tanganyika, and on Cotopaxi in Ecuador.

Within recent years it has been possible to estimate the thickness of the Antarctic and Greenland ice by seismic methods and by measuring the force of gravity. In the former method an explosive charge is set off in the ice below the surface. The time taken for the waves produced by the explosion to reach the rock floor beneath the ice and to be reflected to the surface is a measure of the thickness of the ice at that point. The second method utilizes the fact that the force of gravity at any point depends on a number of factors including the density of the material lying beneath the surface. Different thicknesses of ice will, accordingly, produce variations in the force of gravity which can be measured by very sensitive instruments. Results indicate that the Antarctic ice has an average thickness of more than 1¼ miles and that over much of the central areas of both Greenland and Antarctica the ice is almost 2 miles thick.

The weight of this colossal volume of ice has depressed the land of Antarctica perhaps as much as 3000 feet under the thicker ice so that large areas of the rock floor are beneath sea level. If all the ice were to melt, the land would slowly rise to compensate for the reduced load and Antarctica would truly be seen as a vast continent with towering mountain ranges whose peaks rise more than 16,000 feet above sea level. The western portion, probably, would become an island archipelago.

At the same time, the return of all the water now locked in the ice sheets would naturally raise the level of the oceans. It is difficult to say by exactly how much because the ocean floor would presum-

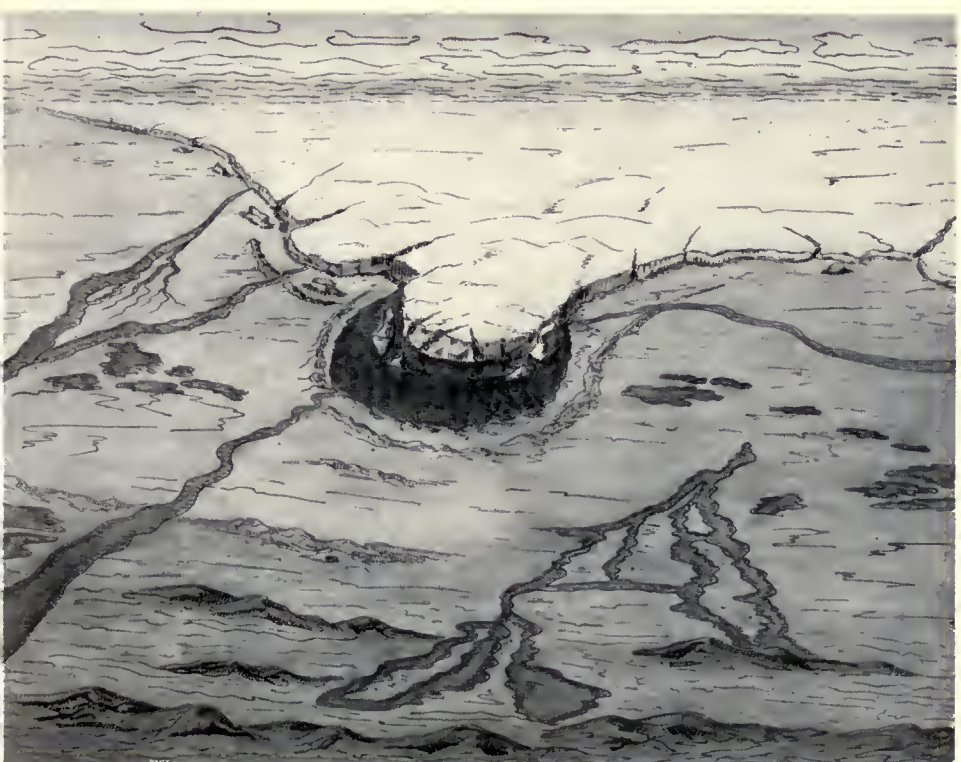
ably sag under the extra weight, but it might amount to about 150 feet. This would be catastrophic for many coastal cities throughout the world.

Glaciers are, of course, active features of the landscape. Snow fall nourishes their surface, which gradually changes downward, by thawing and freezing and compaction, into a denser but still porous mass of spheroidal ice particles called firn, or névé, and then into ice of increasing density. In the initial development of a glacier the continued accumulation of ice eventually leads to instability. The ice tends to deform plastically and to move out under the influence of its own weight, much as a mound of pitch does on a warm day. This plastic flow, which is a complex phenomenon not yet completely understood, will start in a relatively thin mass of ice of the order of about 150 feet in thickness. Increasing thicknesses of ice lead to greater movement and spread of the ice. This movement is naturally aided by gravity. Ice accumulating around the peaks of a mountainous area flows down into the valleys, which become filled with glaciers. However, movement accomplished by the sliding of the whole mass on its bed, is much less than that caused by the plastic flow of the ice itself.

Glaciers continually lose some of their bulk by evaporation, melting—particularly at their extremities—and by calving—that is, the breaking off of large masses into the sea to form icebergs. But as long as nourishment from snow exceeds wastage the glacier continues to expand. Expansion continues until wastage of the enlarged sheet or glacier equals additions to the surface, at which point equilibrium is reached; but although the glacier front is now stationary the ice is still flowing within the glacier. If the rate of nourishment diminishes or if the temperature increases to cause greater melting, the glacier diminishes in size and its margin retreats. The two-mile thickness of the Greenland and Antarctic ice may represent the greatest thickness obtainable in an ice sheet because at that thickness outward flow appears to balance accumulation.

The rate of movement of a glacier is controlled by many factors such as temperature, amount of melt-water, slope, nature of the floor, and thickness of the ice. In the Alps movements of about a foot a day are common. The coastal glaciers of Greenland which issue into the sea have unusually high velocities of up to 100 feet a day, but the main mass of the ice sheet, and also that of Antarctica, moves very slowly—perhaps an inch or so a day.

Schematic perspective sketch of the Chicago region about 8,000 B.C. showing glaciation. The view is northward over the ancestor of Lake Michigan. Drawing by Tibor Perenyi, Geology staff artist.



Advances and retreats of glaciers have been noted in many areas in recent historical times and they have been closely studied in Switzerland where they were readily accessible to centers of learning. Here the retreats revealed clear evidence of glacial action, such as striations on rock surfaces and mounds of debris left by the melting of the ice. During the latter part of the 18th century and the early part of the 19th century the loose superficial detritus which mantled much of the ground of northern Europe was believed to have been deposited by a catastrophic flood equated with the Biblical deluge. As this idea became untenable, a new concept replaced it which advocated the distribution of deposits by drift ice floating on a sea which had once submerged much of the lands. This theory, supported and elaborated by Sir Charles Lyell about 1835, was widely adopted. However, a number of scientists were already proposing the glacial theory for the origin of the deposits and suggesting, from the evidence studied in Switzerland, that there had been a great extension of the glaciers in former times. K. F. Schimper first used the name "Ice Age" in 1837. It was Louis Agassiz, the famed Swiss naturalist, however, who was responsible for the wide acceptance of the idea of the Great Ice Age, expounding it in Switzerland in 1837. Three years later, in London, he provided evidence for the conclusion that much of Britain had been covered by glaciers, and in 1846 he performed the same feat for the northeastern United States.

Today the concept of the Ice Age is completely accepted as fact and a tremendous amount of data is available on its extent, advances, and retreats. The onset of glaciation was presumably gradual and is believed to have been effected less than a million years ago, at the beginning of the Pleistocene epoch. The ice sheets spread over large areas in the Northern Hemisphere (see map) and the areas of mountain glaciation were extended, reaching to much lower altitudes in the Alps, Himalayas, and even

(*Continued on next page*)

in the tropics. The Antarctic ice sheet was undoubtedly larger, submerging even more of the present marginal mountain peaks and spreading out even further into what is now ocean. At the maximum extent it is estimated that as much as one-third of the world's land was under ice. The ice sheet in North America alone probably amounted to nearly 5 million square miles and was 10,000 feet thick in its central region, around Hudson Bay. The withdrawal of water from the oceans lowered sea level possibly as much as 350 to 400 feet below present levels.

Study of the deposits left behind by the ice sheets in North America and

Map of the northern hemisphere. Black areas show existing glaciers; dotted areas the combined maximum extent of the Pleistocene glaciations.

Europe prove that the glaciation was not a single event, but was marked by repeated major advances and retreats of the ice. During the retreats or interglacial periods the ice disappeared from North America and there is floral and faunal evidence that the climate was even warmer than at present. There are generally believed to have been four major glaciations separated by interglacial periods. The latest glacial period had several partial retreats and readvances and evidences of these oscillations are found in the Great Lakes area.

Confirmation of the alternating glacial and interglacial conditions has also been found in cores of sediments lying at the bottom of the Atlantic Ocean and the Caribbean sea. It is possible by measuring the ratio of oxygen isotopes in fossil shells to estimate the surface water temperatures at the time they lived. Also, the sediments containing the shells may be dated by determining certain ratios of radio-active elements. In this way changes of temperature equated with glaciations and deglaciations have been proved and dated. Thus the last major glaciation is thought to have started about 65,000 years ago and to have more or less ended about 10,000 years ago when the sea warmed up, although at that time ice sheets still extended as far south as the Great Lakes.

The vanished glaciers have left behind them many signs of their former presence. The grinding moving mass of ice strongly eroded the ground beneath and modified valleys, gouged out basins which now form lakes—our Great Lakes owe their origin in large part to the ice sheets—and sculptured mountain ranges in characteristic ways. Towards the margin of the ice and in front of it large quantities of debris were dumped as the ice melted back, forming a cover of till, or drift as it is still known, recalling the old abandoned drift theory of its origin. Large temporary lakes were formed in front of the ice, and the deposits in one such glacial lake—"Lake Agassiz"—now form the fertile plains of North Dakota, Minnesota, Saskatchewan, Manitoba and Ontario. Modification of drainage patterns led to the formation of many waterfalls along water courses established after the ice retreated. A notable example is Niagara Falls. The erosional and depositional effects of the Ice Age were truly profound. They influence our scenery, agriculture, transportation, power supply, and urban settlement.

There is still much dispute about the causes of the Pleistocene glaciations with their world-wide advances and retreats. Apart from the necessity of an adequate amount of precipitation of snow to form the glaciers, many people consider that a general lowering of the average annual temperature by some 9° to 13° F. is required to initiate a glaciation.

Many theories have been proposed to account for such a lowering. Changes in the atmosphere, such as greatly increased volcanic dust, which would cause greater humidity and cut off some of the sun's heat, have been suggested but are now little entertained. Theories which not only explain lowering of temperature but would cause periodic increases and decreases have been developed around the known small variations in the earth's motion around the sun. Such periodic changes as would result, however, are generally regarded as being too small in effect to explain the glaciations. Variations in the radiation from the sun have also been invoked. Measurable changes take place related to the 11-year sun spot cycle and elaborate tables have been prepared attempting to correlate these changes with climatic records of historic times and with the glacial advances occurring in the mid-18th and 19th centuries. These attempts are not entirely convincing, however, and the relationships that have been claimed may be illusory or coincidental. G. C. Simpson has produced one well-known theory relating the four glacial periods to two periods of increased solar radiation.

In 1956 M. Ewing of Columbia University and W. L. Donn of Brooklyn College proposed that the glaciations were controlled not by initial changes in temperature but by the interchange of Arctic and Antarctic waters. Flow of warm water into the Arctic ocean would free it of sea ice and cause greater precipitation of snow on the surrounding lands. Development of the ice sheets would themselves cause a deterioration in the weather.

The resulting lower average temperatures throughout the world would cause glacial advances, cooling of the Atlantic, and lowering of ocean levels. Eventually the lowered sea level would inhibit the flow of Atlantic water into the Arctic and the latter would freeze over. Precipitation would decline drastically and the ice sheets would waste away, producing an interglacial period. This trend would be reversed when rising sea level would again permit greater northward flow into the Arctic and the melting of the sea ice.

According to this theory, the Pleistocene glaciation was initiated when the upper layers of the earth slipping over the interior resulted in the present relationships of sea and land relative to the north and south poles. The Antarctic ice developed as a consequence of high

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CHICAGO NATURAL HISTORY MUSEUM *News*

Memorial Fund Contributions

A Museum Memorial Fund was inaugurated last year for gifts made to the Museum in honor of departed friends and relatives. During 1962 contributions were received in memory of the following persons:

Colonel George Langhorne, Mrs. Stanley Field, Mrs. Walter Strong, Holman Pettibone, Walther Buchen, Frederick H. Carpenter, I. H. Streicher, Colin C. Sanborn, Commander Frank V. Gregg, Wilfrid D. Hambly, Mrs. R. M. Strong, George T. Donoghue, Dr. Sharat K. Roy, Karl P. Schmidt.

Nature Photography Exhibit

Nature photographers who wish to compete in the 18th Chicago International Nature Photography Exhibition to be held at the Museum from February 2 to 24 should submit their entries to the Museum no later than January 14.

The photographic exhibition, largest of its kind in the world, is sponsored jointly by the Chicago Nature Camera Club and Chicago Natural History Museum. Last year 455 prints and 2,639 slides were submitted.

This year the slides that have been accepted for the exhibition will be shown at two public viewings—on Sunday, February 3, and Sunday, February 10, at 2:30 P.M., in the James Simpson Theatre.

The exhibition is divided into two categories—prints and transparencies—with contest rules requiring that no more than four entries be submitted in either one. These two major categories are divided again into three separate classifications: 1) Animal Life; 2) Plant Life; and 3) General (any natural history subject not included in the preceding, such as clouds, landscapes, ancient ruins, etc.). Silver medals and ribbons will be awarded in all of the classifications.

Prints submitted from anywhere in the United States must be (and foreign entries preferably should be) mounted on 16 x 20-inch mounts. Color slides or transparencies should not exceed 3¼ x 4 inches. Contestants may enter both slides and prints. The entry fee is $1.00 plus return postage for each of the two categories. Entry forms may be obtained by writing the Museum (Roosevelt Road at Lake Shore Drive), enclosing a stamped, self-addressed envelope.

Staff Notes

Ernest J. Roscoe, a former Assistant in Lower Invertebrates, has been appointed to the staff of the Museum's Raymond Foundation. As a member of one of the Museum's educational divisions, he will organize and conduct workshops, lectures, and tours on the subject of geology. Roscoe graduated from the University of Utah, and has done post graduate work at the universities of Michigan and Kansas. His master's degree was obtained in zoology, and he has also a strong background in geology.

Dr. Edward J. Olsen, Curator of Mineralogy, has been appointed a Lecturer in the Department of Geophysical Sciences, University of Chicago. Dr. Olsen is the second member of the Department of Geology so honored by the University, the other being Dr. Rainer Zangerl, Chief Curator of Geology, who was appointed a Lecturer in 1948.

Morris Johnson, skilled carpenter in the Museum's building and maintenance department, retired at the end of 1962 after 34 years of service. Johnson, who first came to the Museum as a carpenter in February, 1928, will be missed by those who have worked with him through the years.

Credit

Credit for compliments received on the December BULLETIN cover featuring Chinese belt toggles belongs to Theodore Halkin, artist in the Department of Anthropology, who designed the cover, and to John Bayalis and Homer V. Holdren, who made the photographs.

Audubon Lecture

"Pika Country," a color wildlife film by Emerson Scott, will be presented free on Sunday, January 6, in the James Simpson Theatre at 2:30 P.M. The movie is the fourth in a series of nature films scheduled at the Museum during 1962 and 1963 by the Illinois Audubon Society.

Free Concert

A reminder to those who have not yet written for tickets to the Gerard Souzay–Maureen Forrester joint recital to be presented on Wednesday, January 16, at 8:15 P.M., in the James Simpson Theatre: tickets may be obtained by sending a stamped, self-addressed envelope to Free Concerts Foundation, Chicago Natural History Museum, Roosevelt Road at Lake Shore Drive, Chicago 5.

Chicago Natural History Museum
Founded by Marshall Field, 1893
Roosevelt Road and Lake Shore Drive, Chicago 5
Telephone: WAbash 2-9410

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Members are requested to inform the Museum promptly of changes of address.

SUCCESS IN VIEW

A third report from the W. S. and J. K. Street Expedition of Chicago Natural History Museum to Iran

Tehran Palace Hotel
Tehran, Iran
October 11, 1962 (By W.S.S.)

As reported in last month's BULLETIN, at our second camp located near the village of Sama, we hunted in the forests at an altitude of from 4,000 to 8,000 feet. Then we dropped down to Chalus and camped on the shores of the Caspian Sea, 85 feet below world sea level.

A highlight of the collecting at Chalus was Douglas Lay's discovery of mole burrows all over the forest floor. Though hampered by several days of heavy rain, he managed to collect several specimens. Another stimulating catch was a nice series of shrews. We also got a large series of a species of horseshoe bat for which this is the third Iranian locality. Doug was the lucky one to collect our first specimen of the jungle cat, *Felis chaus*. On the night of the earthquake,[1] Doug was out pig hunting. Mrs. Street and I had driven back across the Elburz Mountains to Tehran for provisions, and Doug didn't even know about the earthquake catastrophe until three days later when we returned.

After about a week at Chalus, we took off for West Azerbaijan. Most of the animals that we finally got there were known to be in Russia, Turkey, and Iraq, across the border, but had not yet been found in Iran. It was rewarding to come away with incontestable evidence of their presence here. Thus we are fulfilling the goal of the Museum expedition, which is to increase the knowledge of the mammalian fauna of Iran.

In her last report, Janice mentioned the exciting road from Tehran to Chalus, which winds up to around 11,000 feet and then down to 85 feet below sea level,

Douglas Lay and Mrs. Street in camp near Rezaiah

all in four and a half hours of travel. The road was built by the Germans for Reza Shah, the present Shah's father, and is mostly paved. The road from Bandar Pahlevi (see map) to Astara is another matter. Its washboard surface left us, and the cars, quite shaken.

Astara is on the Russian border—a highly sensitive spot. The U.S.I.S. in Tehran was very doubtful of our ability to get there without military passes, and the Iranian Embassy in Washington had been downright discouraging. We only had letters from the Iranian Game Council to their outlying office in Rezaiah, but we bravely charged into Astara and were promptly escorted to the Military Intelligence headquarters. A nice Iranian officer, some pleasantries by us, and the Game Council's letter did the trick.

At Ardabil the same thing happened, and we were again O.K.'d. At Rezaiah an intelligence man caught up with us. However, all was well. The local head of the Game Council to whom our letter was addressed took us in hand beautifully. He had me meet the general in charge of the entire West Azerbaijan area, and also the Governor General. The latter, it turned out, had a daughter at the University of California at Davis, where Janice's niece had been—a part of the University of California dear to our hearts. We were quick to advise him of this and he brightened perceptibly and went out of his way to respond.

Our scientific collecting from Camp Six, near Rezaiah, was very productive. The expedition took what Doug thinks may be a new species of bat; certainly it is at least a new record for Iran. The hunting was not too good for the large animals, but we got lots of small mam-

[1] September 7. More than 7,600 people were buried in this catastrophe.

mals: foxes, rabbits, bats, mice, otters, and wildcats. We did not get a wolf, but I was very pleased to shoot a beautiful otter one night for the collection.

From Rezaiah we drove 180 miles northward to Maku, near the Turkish and Russian borders. It was surprising to see the number of adventurous souls driving along this road which leads from Europe to Asia—mostly Germans and English, some by car or jeep, some by motorcycle, and some even hitch-hiking!

In the vicinity of Maku we collected wild goats, six kinds of bats, many kinds of rodents, two insectivores, several hares, and a wild pig. Often Doug and I, or more rarely Janice, would get up on top of the car to sit in the spare tire frame which is laid flat on the front of the top of the car. There, with our headlights on and swaying with the car, we hunted at night. On one such night two nice jerboas ran across the road in front of the car. (The jerboa looks like a kangaroo rat, with long hind legs that propel it like a rocket.) After an hour or so, with some adroit driving by Nicola and a lucky shot from me on the top of the car, we got one. Doug thinks it is a second record for Iran, the only other being from 500 miles away.

Camp near Gurgan

October 23, 1962 (By J.K.S.)

It is a wet, foggy morning. We are encamped about five miles southeast of Gurgan at an elevation of 1,100 feet and on the edge of a beautiful forest. It's a nice camp, with good water (no villages above us) and a tremendous vista of Gurgan and the Turkoman plains.

After leaving Tehran, we headed for Semnan. We arrived there quite late when it was very dark except for the bright starlight. We found a shelter dug into the cliffs well off the road, and there we put our lantern and kerosene burner and made a huge kettle of soup. When the moon came up, it was quite picturesque. That night we all slept out under the stars and we pitched the tents next morning.

At Semnan, Bill, Nicola, and I took a climb, hoping to find wild goats. Up about 1,500 feet through a pass we stalked, only to find rocks and cliffs but nary a living creature. We also had a local hunter out for a day and a half, and he returned empty-handed. However, we did find numbers of fat, roly-poly conies, or pikas.

In the meanwhile, Doug visited an abandoned mine shaft up the mountain. He found one bat there, which he thinks may be a new one for Iran. He also shot a big sand viper on the rocks.

The trip from Semnan on to Gurgan was both interesting and beautiful. Following a most winding road, we climbed through and around the bare, stark mountains. The colors were utterly fabulous—red, rosy brown, turquoise, earth brown, and bits of pale bronze. A new facet of beauty emerged around each curve. It was thrilling to see the jagged, knife-like ridge against the blue sky. When we reached the summit at 8,000 feet a great plain lay beneath us, all the soft desert colors climbed to the sky, and the villages melted into the landscape.

Dark settled in early, and we couldn't find a place to camp, so we decided to go in to Gurgan and try to find a hotel. It was well after eight when we arrived, and it was raining and miserable.

We entered the hotel through a narrow, battered hall and into a courtyard. Bill took three rooms: one for Douglas and Nicola, one for Niqui, Bahran and Ali, and one for us. Now this wasn't like the Tehran Palace Hotel or the Blackstone in Chicago, but they allowed us to carry in our pot of chicken stew to warm in the kitchen and our own bread. And the beds looked clean. We ate dinner on a table in the second floor hall, finishing about 11:15 P.M. with everybody happy.

Next morning the four of us went to see the local head of the Game Council. He was ill in bed on the floor, but received us with a beret on and cookies and fruit there on the floor beside him. His wife was charming to us and we were served cookies, fruit, and Turkish coffee in tiny cups. He called the Governor for us and made an appointment. Later Bill and Nicola saw the Governor and reported that he was delightful, and that he warmed up to all the information about the expedition. From there we went to see the colonel who is in charge of this border area. We took passport pictures of Douglas with the Polaroid, and in an hour we had official permits signed and sealed for every place we wanted to go until our return to Tehran. All he stipulated was that we please don't shoot too near the Russian border.

After setting up our camp near Gurgan, Bill, Nicola, and I drove out on the Turkoman plains to within 20 miles of the Russian border. There we found things bare and bleak. A few camels and poor cows could be seen. At the town of Pahlevi Dezh the Turkoman men wear cossack hats of black caracul, with velvet crowns of emerald green, gold, or beige. The shape of their eyes is quite mongoloid. The women wear bright shawls over their heads, or a headpiece that looks like that of a Red Cross worker, in white with colors on the head-

(*Continued on next page*)

band in geometric patterns.

On our way back we took five specimens of a little earth hare, the same species that we had taken near Maku. This morning we found a new shrew, and we have another small wild pig, too—making four.

It was so rainy yesterday that we stayed in camp and skinned and stuffed small specimens all day. I skinned the expedition's mammal specimen number 500—a rat! Douglas says we're "racking them up."

Camp near Dasht

November 1, 1962 (By W.S.S.)

We have now collected two species of jerboa in good series, and a large series of the great gerbil, taken within four miles of Russia, in view of the Russian towers guarding the border.

In night hunting, we have taken two specimens of the local race of red fox. We have also added three African wildcats and two jungle cats to the collection. Two porcupines, two pigs, and two boar skulls were brought in to us. We found evidence (one good enough for catalogging) of hedgehog, but saw no whole ones. Jackals are all over the place and we stopped collecting them after taking four or five. We have about eight rabbits now, both from the plains and the forests. We have also taken field mice, house mice, shrews, and black rats and Norway rats from the village.

One of the jungle cats I just happened to spot one night when its eye was reflected from our car lights. It was on Doug's side, and he got it. This turned out to be a really big one, 38 inches long! We saw the second jungle cat while going through a wooded stretch on our way back to camp after night hunting. When I went into the woods after him, making squeaking sounds on my hand, he stopped and turned around to look. There were only 8's in my 20-gauge, but he was so close that was big enough.

Many of the specimens taken here were obtained in an eventful 48 hours of collecting that began at Sunday noon. Jan and I and Doug and Nicola left for an overnight stay out on the Turkoman plain. We went first to the town of Pahlevi Dezh for bats. The principal of the school said there were bats in between the ceiling and roof of the schoolhouse. At 3:00 P.M. we were climbing a rickety ladder up to the hole under the roof, to the joy of the kids and I guess the teachers, who suspended classes to watch. While we hunted, Jan took pictures and read English stories for the English teacher and students. We found only skeletons, so proceeded to climb into the tops of two houses in town. Got one live one there. We next drove about five miles back toward Gurgan where we put a mist net over a pond by the road. In the dark, Jan and I stood on the hood of the car with the car motor running to keep up the battery and played our big searchlight on the bats as they'd come flying by. For a box of shells, we got four bats, each of us getting at least one. It was fun and sporty.

We had one more try at night hunting for foxes. Saw many; got none. We then drove about 30 miles north, and all three of us collected a share of jerboas before we quit at about 2 A.M. Then we put out cots, took a shot of bourbon, and went to sleep. The next morning we collected more great gerbils and Libyan jirds,[2] and then drove back to Pahlevi Dezh for another bat hunt. After finding two, we turned toward camp, collecting rabbits and the big cat on the way. We arrived home at camp about 9:00 that night.

Doug worked until midnight, getting Niqui started on the skinning, and then he and I took off with Nicola at 1:00 A.M. for more road hunting. When we returned about 10 o'clock the next morning it was with a Corsac fox. I had also bagged a porcupine, a rabbit, and one hamster, and Doug had dropped an African wildcat. I had had about one hour's sleep, and Doug none, but we had gotten what we wanted—two Corsac foxes instead of one.

Later we found that the big jungle cat had nine mice in its stomach and a species of shrew we had not encountered in the field. In the meantime, Ali had been racking up shrews and rodents from the traplines. A local hunter brought in a porcupine, and there really was a lot of skinning to do.

We didn't get away from camp until 1 P.M. yesterday. So much had piled up that Doug took hours to get his tent cleared out, notes written up, and labels on everything. But I feel very proud of what the expedition has accomplished at the Gurgan stop. We have over 60 species of mammals represented among the expedition's (now) 600 specimens so we feel that maybe we have already reached the level of the largest single study collection of mammals that any expedition has ever been able to bring out of Iran. (*To be continued*)

[2] A small mouse-like desert rodent.

GLACIERS—

(*Continued from page 4*)

land at the pole and was not so subject to the changes affecting the areas surrounding the polar Arctic ocean. Thus the ice sheet there persisted through the interglacial periods as it does today.

That there was a change in the position of the poles in earlier geologic periods is supported by the finding of coal seams and fossils in Antarctic rocks, proving that the glaciers were absent and the climate warm even in times as geologically recent as 50 million years ago. Likewise, deposits proving a widespread glaciation in South America, Africa, India, Australia, and even Antarctica between about 310 and 280 million years ago suggest not only a different pole position but also that these continents may then perhaps have been part of a much larger land mass.

Since the Arctic ice at present shows signs of decreasing, it is interesting to speculate that, if the control of Pleistocene glaciation is something along the lines postulated by Ewing and Donn, we may be heading into a new glacial period. Of course a new Ice Age would take thousands of years to develop. It may be, however, that a world wide lowering of temperature is required for a new glaciation. In that case, the evidence at present of a global amelioration of climate, as shown by the general retreat of glaciers and warming of the oceans, suggests that we may still be emerging from the last glaciation. Further contraction of the glaciers and rising seas may lie ahead before the onset of a new Ice Age, many thousands of years hence.

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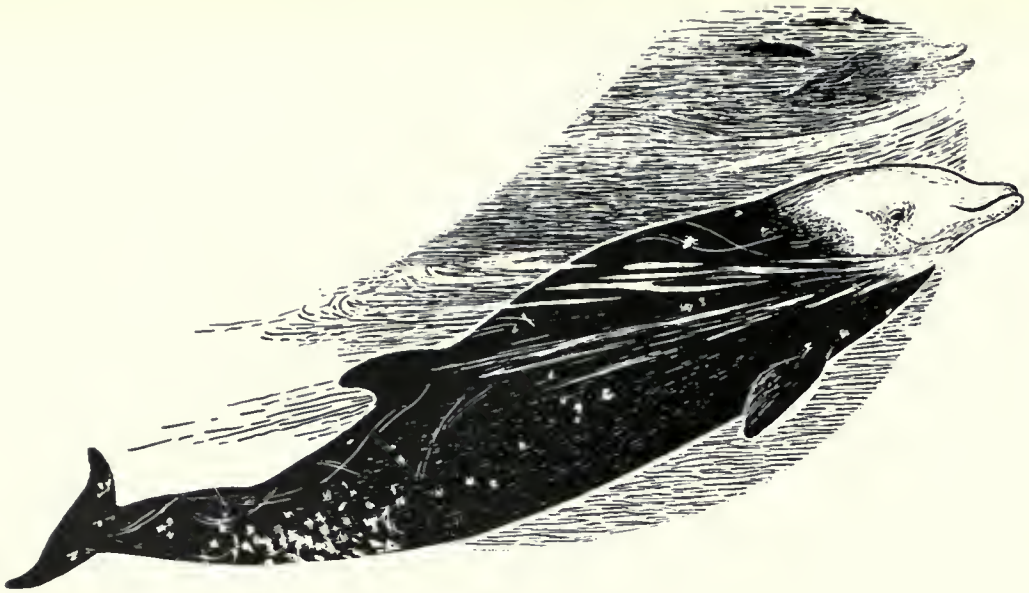


The

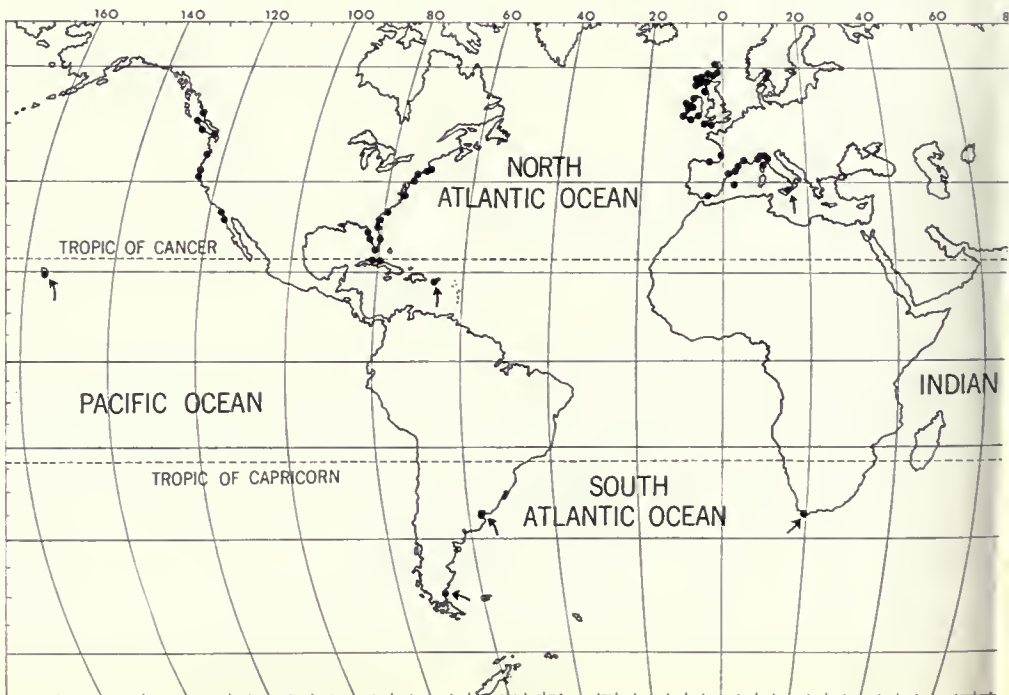
On a coral reef off the southern coast of Puerto Rico one day in February of 1961 two local fishermen found a strange small whale stranded in shallow water. It appeared to have just died, and they attached a line to it and towed it in to the town of Parguera only a mile away. There, fisheries biologist Douglas Erdman examined this rare find with some excitement. It looked like a large dolphin, but it had no teeth. It had two deep, converging grooves on its throat. The trailing edge of the tail had no notch in the middle. These characteristics, he knew, meant that it belonged in the family of the beaked whales. A keen observer of marine life, he also knew that any beaked whale species would be rare in Caribbean waters. On investigation he found that no beaked whale had ever before been reported from Puerto Rico.

To help him determine its species, Mr. Erdman made a couple dozen measurements of the whale's body, and took some photographs. The animal was a female, 18 feet long. With the help of the fishermen, the biologist carefully cut the dark fresh meat away from the skeleton. The little whale's stomach, he noted, contained undigested eyes, beaks, and pens of small squid species, showing what the whale's last meal had been.

When the skeleton had been buried for two months in the beach sand in a well marked place that was safe from excavation by storm, Mr. Erdman relocated the site and carefully exhumed the now clean bones. To his pleasure he found that at the tip end of the animal's lower jaw there was a pair of vestigial teeth which did not show above the gum in life but were well over two inches long and about as big around as his little finger. Now he felt sure that he could identify his whale as the goose-beaked whale, *Ziphius cavirostris*. Sending the teeth and some photographs, he wrote to the present author to see if his identification would be confirmed. Mr. Erdman was right, and the author helped him to write a scientific report on the first beaked whale to be known from Puerto Rico. Mr. Erdman kindly helped negotiate the acquisition of the skeleton of the whale for preservation among the scientific study collections of Chicago Natural History Museum.

The female goose-beaked whale from Puerto Rico is the second specimen to represent the beaked whale family, *Ziphiidae*, in Chicago Natural History Museum. The first is the skeleton of a bottle-nosed whale, *Hyperoodon rostratus*, obtained about 1900 from the North Sea. (This specimen is on exhibit in Hall 19, first floor, west.) The goose-beaked whale thus represents a genus of mammal new to the museum's scientific collections and a family of mammals of which we have only the one other specimen.

The living members of the beaked whale family number about 15 species. They are all small whales, ranging from about 14 feet long in the smallest species to about 40 feet in the largest. The latter, *Berardius bairdi*, is hunted commercially off the Japanese and Canadian Pacific coasts, and the northern bottle-nosed whale, *Hyperoodon rostratus*, is hunted by Norwegian small whale catchers. Other beaked whale species apparently constitute an appreciable part of a



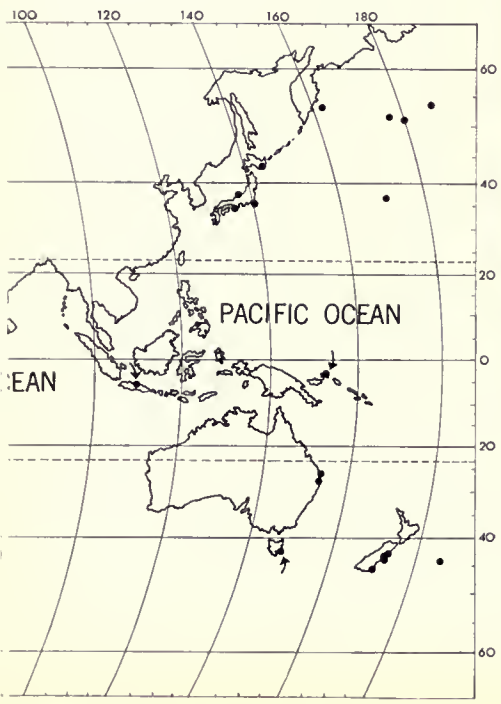
GOOSE-BEAKED WHALE

Where in the World?

JOSEPH CURTIS MOORE
Curator of Mammals

commercial catch only in Japan. There were 85 goose-beaked whales taken during a five-year period in Japan, during which time 924 individuals of *Berardius bairdi* were taken by the same small cetacean catcher boats.

The goose-beaked whale does not appear to be common anywhere, but we can show in the accompanying map that when one plots the localities where specimens published upon by scientists were originally found, the goose-beaked whale appears to have nearly world-wide distribution. It is easy to see on this map that in a general way the known occurrences are most numerous in the areas where there have been the greatest numbers of scientific societies observing and publishing their observations of natural phenomena. One should be warned, however, that the origin of the specimen recorded for the southern tip of Africa is subject to some controversy. The history of its origin was reported to have been lost before the specimen was recorded as from Capetown, South Africa, and it could conceivably have been shipped in to Capetown from some distant place. Since South African naturalists have reported and preserved specimens of many kinds of whales and dolphins stranded on their coasts over the years, and no other specimen of *Ziphius* had turned up by 1952, one South African authority of broad scientific experience refused to admit that the goose-beaked whale occurs in South African waters. It certainly does occur even farther south in waters off South America and New Zealand and Tasmania, we can see. The map reveals surprising gaps in knowledge of this whale's distribution along the coast of eastern North America north of Cape Cod and from the vicinity of the mainland of Alaska. These gaps may also be quite real.



Above: *The vestigial teeth of the female goose-beaked whale.*

Left: *World map of distribution of the goose-beaked whale showing this little whale to be almost cosmopolitan in temperate and tropical seas, but that it has not been found in certain areas where the cetacean fauna is fairly well known.*

Drawings by Marion Pahl, Staff Illustrator.
Photographs by Division of Photography.

For several years the author has been chairman of the Committee on Marine Mammals of the American Society of Mammalogists. This group of a dozen scientists is undertaking to report cooperatively on the occurrences of marine mammals along all of the continent of North America north of Mexico. Each member of this group except the chairman gathers his data from a separate sector of the North American coast near which he lives. One of our principal purposes is to advance knowledge of the distribution of such relatively rare animals as the goose-beaked whale.

The first contribution resulting from this concerted, round-the-continent effort is now in press as a 350-page symposium of eleven scientific papers reporting on the occurrences of marine mammals—and a great deal else discovered about them—along the North American coast from Florida north around the continent to California. The symposium contributes a great variety and amount of new knowledge to add to the surprisingly little that was already known about marine mammals of North American waters.

This cooperative undertaking has been greatly advanced by the contributions of interested amateurs and by scientists who are specialists in other fields but who think it kind of fun to measure and photograph a stranded whale and send the data to the member of the Marine Mammals Committee working on the particular coastal sector. Each committee member receiving such data identifies the whale from the photographs (or sometimes bones), advises the finder what it was, and integrates the data with his accumulating report for the next symposium. A leaflet showing how to

(*Continued on page 8*)

CHICAGO NATURAL HISTORY MUSEUM *News*

Board Elects New Trustee At Annual Meeting

Mr. Edward Byron Smith, President of The Northern Trust Company, was elected a Trustee and Corporate Member of the Museum at the annual meeting of the Board of Trustees held Monday, January 21.

Mr. Smith is a graduate of Yale University and is Trustee and Treasurer of both the Art Institute of Chicago and the Chicago Zoological Society. He is a son of Solomon A. Smith, Museum Board member, who has been Treasurer of the Museum for 48 years.

This Spring's Free Programs For Children

The spring series of free motion pictures for children begins on March 2, and continues each Saturday morning (except April 13) during March and April. All programs are presented at 10:30 A.M. in the James Simpson Theatre. Following is the complete schedule:

March 2—Happy Holiday in the Land of Lincoln
The story of Illinois from the earliest Indian mounds
Cartoon also

March 9—At Home in the Woods (*Camp Fire Girl Day*)
Familiar sights and sounds in our woods

March 16—The Bald Eagle, Our National Bird
A documentary film showing habits, behavior, and seasonal movements of this bird
Cartoon also

March 23—For Generations to Come
Wisconsin—its natural history yesterday, today, and tomorrow

March 30—About Time
The development of man's knowledge of time and timekeeping— seasons, calendars, and time pieces form a part of the story

April 6—Circle of the Sun (*Museum Traveler Day*)
In Alberta, Canada, the color camera catches one of the last gatherings of Blood Indians, allies of the Blackfoot, celebrating the passing glory of their tribe

No Program on April 13 (*Easter Saturday*)

April 20—Village Beneath the Sea (*Cub Scout Day*)
Life in the deep blue waters of the Bahamas

April 27—All Canada Program (*Girl Scout Day*)
Honoring Toronto–Chicago Campers Exchange for the summer of 1963

New Museum Appointments and Staff Changes

The following staff appointments and changes, effective January 1, 1963, have been announced by Mr. E. Leland Webber, Museum Director:

Department of Anthropology

Mr. Christopher Legge, Custodian of Collections

Miss Mary Hogquist, Assistant

Department of Geology

Mr. William D. Turnbull, Associate Curator of Fossil Mammals

Dr. Bertram G. Woodland, Curator of Igneous and Metamorphic Petrology

Department of Zoology

Mr. Mario Villa, Tanner

Library

Mr. W. Peyton Fawcett, Associate Librarian

Mr. Chris Priesmeyer, Harris Extension driver, retired on December 31, 1962, after 20 years' service.

Mr. E. John Pfiffner, Staff Artist for seven years, has resigned from the Museum in order to devote his time to free lance work. During his service to the Museum, Mr. Pfiffner made many outstanding contributions in the areas of exhibition and scientific and popular illustration.

Mr. John Besch, cabinetmaker in the Museum's maintenance division for 22 years, died last Christmas Day at the age of 69. Mr. Besch came to the Museum in 1941 as a carpenter. Although he was eligible for a pension in 1958, he continued working as a carpenter, at first full time and then on a part time basis, until his death at the end of the year. He will be missed by his many friends at the Museum.

"WHALES"

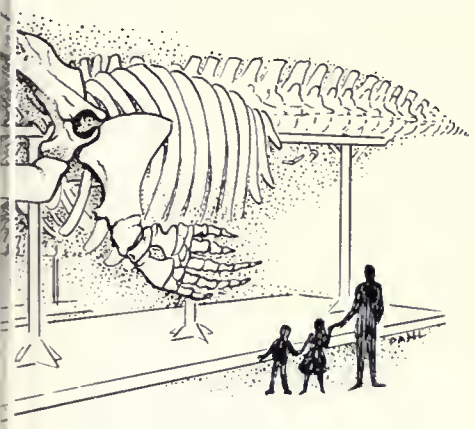
FEATURED EXHIBIT FOR FEBRUARY

In the Museum's Hall of Whales (g
largest animals that have ever inhabit
same scale as the model of a six-foot m
liantly colored white-sided dolphin ar
tropical rivers, are displayed in full-size

A lively frieze of murals portrays som
hunting seals by breaking up, from bel
schools of squid, or suckling their you
of the hall a spectacular scene depicts
sperm whale, in contrast to the "factor
trated on the opposite wall. Also on di
teeth on which designs were incised b
whale ivory or bone in fond memory of

In the adjacent hall, a life-like, habit
tusk was thought in the Middle Ages t

On the first floor, in the Hall of Skele
etal structures of a 45-foot right whale a
of the goose-beaked whale discussed in



door, west), one may see models of these globe reproduced for comparison on the rpoises and dolphins, including the bril-ller cetaceans that inhabit fresh-water ductions.

e life-habits of different kinds of whales— e ice floes on which they rest, feeding on he manner of all mammals. At one end erous moment in the chase of a gigantic ' methods of modern whale-fishery illus-ure scrimshaws, the name given to whale ers, and fanciful pie-crimpers carved of ngland home cooking.

ip of the narwhal, whose strange, spiraled ig to the mythical unicorn, can be seen.

Hall 19, west), visitors may study the skel-he smaller, bottle-nosed whale, a relative icle beginning on Page 2.

Curator Studies Peruvian Birds At Peabody Museum

Emmet R. Blake, Curator of Birds, spent a week recently at the Yale Peabody Museum in New Haven, Connecticut, identifying birds from southeastern Peru—a region in which Blake himself collected in 1958. Blake is currently writing a report on the birds of the Rio Madre de Dios drainage basin in the lowlands of southeastern Peru. His trip to Yale has enabled him to gather additional material for his report, while at the same time assisting the Peabody Museum in completing its records.

Lucerne Festival Strings To Perform In Free Concert

The Lucerne Festival Strings, a group of 13 virtuosi musicians who play chamber works, will perform in the James Simpson Theatre on Tuesday, February 26, at 8:15 P.M., as the fourth program in the Free Concerts Foundation's 1962–63 concert series. Tickets for the performance may be obtained by sending a stamped, self-addressed envelope to Free Concerts, Chicago Natural History Museum, Roosevelt Road at Lake Shore Drive, Chicago 5.

Founder and sponsor of Free Concerts Foundation is Mrs. J. Dennis Freund, who has been presenting well-known artists in free concerts at the Museum since 1959.

Museum Paleontologists Elected Officers Of Science Society

Dr. Robert H. Denison, Curator of Fossil Fishes, was elected President of the Society of Vertebrate Paleontology at the society's annual meetings held recently in Austin and Houston, Texas. Also elected to office was Dr. Rainer Zangerl, Chief Curator of Geology, who will serve as Secretary-Treasurer of the society during 1963.

Mammalogist Receives N.S.F. Grant To Study Whales

A National Science Foundation grant of $8,000 has been awarded Dr. Joseph Curtis Moore, Curator of Mammals, for support of his current revision of the beaked whale genus, *Mesoplodon*. The grant became effective on January 1 and will be applied over a period of four years.

His studies on the beaked whale also have gained Dr. Moore an invitation to participate in a symposium on International Cetacean Research scheduled for Washington, D. C. in August. For the symposium Dr. Moore will review those species of a polytypic genus of the beaked whale family, *Ziphiidae*, which live in North American waters. In August, Dr. Moore expects to begin a trip around the world to study museum specimens of beaked whales.

Last Audubon Program Sunday, March 10

"Waters and Wildlife," a film trip down the Missouri and Mississippi rivers to the Gulf of Mexico and the Florida Keys, will be presented free on Sunday, March 10, at 2:30 P.M. in the James Simpson Theatre. The program will be the last of the Illinois Audubon Society's 1962–3 series of wildlife films.

Chicago Natural History Museum
Founded by Marshall Field, 1893
Roosevelt Road and Lake Shore Drive, Chicago 5
Telephone: WAbash 2-9410

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Members are requested to inform the Museum promptly of changes of address.

Presenting the Spring

FILM-LECTURES

for Adults

GLIMPSES OF NATURE AND PEOPLE AROUND THE WORLD

March 2—South Sea Isles

Karl Robinson

The colorful and romantic islands of the South Pacific, once a remote travel dream for most Americans, have suddenly, with the emergence of the jet age, become possible vacation targets for an increasing number of travelers. Unlike Europe, whose glories have been extolled by millions of Americans, the wonders of the South Pacific are relatively little known. *South Sea Isles* is a color-film interpretation of these still-mysterious island clusters. It concentrates mainly on the Society Islands of Tahiti, Moorea, and Bora Bora, and on the islands of American Samoa. The theme of Robinson's program is the fascinating cultures of the Central Polynesian isles, where uncomplicated and joyous living is still manifest in an unharrassed and unhurried world.

March 9—Ecuador's Galapagos Islands

Alfred M. Bailey

The Galapagos, made famous by Charles Darwin's studies in 1835 which resulted in publication of *The Origin of Species*, are a group of volcanic islands that straddle the equator approximately 600 miles off the coast of Ecuador. They have long been of great interest to naturalists because of the remarkable variety of animal life inhabiting their isolated shores—great concentrations of marine iguanas, reptiles, giant turtles (which gave the island group its name), cormorants, albatrosses, penguins, and sea lions. Alfred M. Bailey, Director of the Denver Museum of Natural History, made his film while on an expedition for the Museum to obtain animal specimens for a new habitat exhibit. His program includes an unusual underwater sequence showing the fish, sharks, and manta rays that live in the equatorial waters around the islands.

March 16—Around the World

Joseph Polo

Perhaps compelled by the legacy of his name, Joseph Polo, airplane pilot and automotive engineer, decided to travel around the world. Like his famous predecessor, he was motivated by the quest for new knowledge. Important stops on his travels included: Tokyo, Kyoto, Seoul, Hong Kong, Singapore, Bangkok, Calcutta, New Delhi, Bethlehem, Jerusalem, Cairo, Beirut, and a number of European cities. Polo brought back the new knowledge he was seeking, but in a 20th century manner—on color film—so that he might share his adventures with others. The result is a program notable for the perfection of its technical effects and its depth reporting.

Samoan children. From "South Sea Isles," program for March 2.

March 23—For Generations To Come

Howard L. Orians

According to Howard Orians, Wisconsin—the "milk pail" of America—is much more than just a dairy state. He proves his point in what is, in effect, a motion picture testimonial to Illinois' northern neighbor. The film begins with a glimpse of Wisconsin as it is thought to have been in 1643, and then abruptly switches to the Wisconsin of 1963. Special attention is called to the state's outstanding scenic attractions—Copper Falls State Park, the famous Dells of the St. Croix, the hilly countryside of the far north—and to Wisconsin's conservation plans to preserve its resources for the future. Under the category of conservation Orians discusses such questions as: How can an expanding population be fed without the encroachment of farmland upon the region's scenic treasures? What will happen in a few years to the wildlife of the states—will other birds suffer the fate of the passenger pigeon? And what effects may we expect from the vastly increased use of pesticides?

March 30—Panama, Land of Contrast

Murl Deusing

With the opening of the Panama Canal by the United States in 1914, the little

country of Panama, isolated for so many years from most of the world, suddenly came into the political and commercial spotlight. As a result, a number of changes have taken place within this tropical country in a very short time, creating a land of great contrasts. On the one hand there is lively Panama City —with its slums and also its modern buildings, and its gay and noisy Carnival, the Latin American Mardi Gras. But just a few minutes' travel outside the city brings one to jungle trails where peccaries, anteaters, coati mundi, white-faced monkeys, toucans, parrots, and many other animals can be seen living in wild profusion. Included in the film is a visit to the nearby San Blas Islands for a glimpse of the proud and independent Cuna Indians who permit no white man to remain on their islands overnight.

April 6—Eternal Rome

Nicol Smith

Rome—the Eternal City, the city of fountains—is fast becoming the most popular goal of travelers in Europe. The reason? Rome provides something for everyone. For the student of history there are the magnificent ruins of the ancient forum, always an unexpected thrill when the visitor comes upon them in the very midst of a 20th century city. For the artist or art lover, every vista contains something of merit, with one of the most outstanding collections of art treasures in the world being housed in the Vatican Museum. For the gourmet the city's restaurants offer an endless variety of gastronomic treats. And to anyone just looking for a good time, Rome is gay, hospitable, and entertaining. Nicol Smith has succeeded in creating a fascinating film portrait of a city with many faces.

April 13—Unique Petite Belgique

Robert Davis

Belgium, one of the most densely populated countries of Europe, of necessity has had to gear its economy to industry and highly developed skills. The result has been the flourishing of arts and crafts and the enjoyment of one of the highest standards of living in Europe. It is Davis' feeling that the key to the spirit of Belgium is its people, who speak four languages. His film program is about these people, both at work and at leisure. It includes scenes of lace makers, from four to 80 years old, who spend their days tossing bobbins; artists cutting stained glass for magnificent windows; farmers harvesting tobacco and wheat using the world's finest Brabantine draft horses; industrious diamond cutters, polishers, and buyers at Antwerp, world center of the diamond cutting industry; and the miners of the coal regions.

Ten thousand athletes stage a mass spectacle in a Moscow stadium. From "Russia," program for April 27.

April 20—Village Beneath the Sea

Harry Pederson

Almost as remarkable as the great strides now being made in space exploration is man's investigations of the ocean's depths. *Village Beneath the Sea*, filmed in the Bahamas, is a film record of life in the crowded sea. Hidden in the turquoise waters off the Bahamas are unique communities with permanent populations and patterns of living. In this underwater world, Pederson found comedy, tragedy, dramatic action and, above all, adventure. The producing of this film, in itself, was a 12-year adventure story for Pederson, who is recognized as one of the leading undersea authorities. In addition to his own programs, he has contributed film footage to a number of Walt Disney's most successful film productions, notably, *The Sea Around Us*, *Twenty Thousand Leagues Under the Sea*, and *Mysteries of the Deep*.

April 27—Russia and Its People

Raphael Green

Much has been written during the last few years about life in the Soviet Union, so that most Americans have numerous impressions of our cold war adversary. Since reports on the U.S.S.R. by those who have traveled there so often are contradictory, it is no wonder that, in spite of all the available information, there exists in the mind of the American public a certain confusion as to what is the real "truth" about Russia. Raphael Green is one of the few American cameramen ever permitted free range behind the Iron Curtain. Traveling thousands of miles alone throughout the vast country, he photographed the Russians at work, at play, on the collective farms, and in the city markets. He even filmed the Kremlin leaders at a state funeral in Red Square. The result is a factual film that offers a unique opportunity for each viewer to become better informed about the Russian people of today.

All programs begin at 2:30 P.M. in James Simpson Theatre. Reserved seats will be held for Members until 2:25 P.M.

WHALES (*Continued from page 3*)

Goose-beaked whale skull is catalogued at Chicago Natural History Museum by Jeanette Blizard. The under side of the whale's skull is shown; the specimen is resting on the back of the skull with the beak pointing up.

measure a whale, porpoise, or dolphin is available for persons who want to participate in this undertaking.[1]

A Canadian cetologist, D. E. Sergeant, has just recently discovered that distinguishable layers of dentine are deposited at the rate of one a year on the walls of the pulp cavity of the teeth of captive bottle-nosed dolphins of known age. Bottle-nosed dolphins belong to the cetacean family of dolphins, *Delphinidae*. Probably this break-through on how to discover the age of an individual dolphin may be applied to the goose-beaked whale, a member of a different cetacean family. If so, then an American zoologist has now found that two goose-beaked whales just obtained from Amchitka Island in the Aleutians are an 18-foot male 13 years old and a 21-foot female 24 to 28 years of age. In the female the pulp cavity of the teeth was very nearly filled. The accompanying photograph of the teeth of the female goose-beaked whale from Puerto Rico shows the mouth of the pulp cavity. In this Puerto Rican female's teeth the pulp cavity is almost completely filled; so that she may also have been in, or beyond, her middle twenties.

These small whales live on the high seas and feed upon squid which occur there in immense schools and are said to be slower swimmers than fish and easier to catch. The stomach of the Aleutian female goose-beaked whale contained the undigested horny beaks of 1,292 squids. In the seas about Japan where it was possible for Japanese scientists to compare the lengths of 34 females with 51 males, the females seem to run very slightly but definitely larger than males. Three of the five pregnant females reported in Japanese waters were taken in the month of August, and a female ready to give birth stranded at about the same latitude on Long Island, New York, also in August. Since the other two pregnant females from Japanese seas were taken in September and October, the season of birth as known in northern latitudes is late summer and fall.

It seems curious that the habits of a whale whose geographic distribution is so wide and so well known should remain so mysterious, but little by little science is delving further into the secrets of the lives of these fascinating inhabitants of the high seas.

[1] A copy of "Standardized Methods for Measuring and Recording Data on the Smaller Cetaceans," prepared by The Committee on Marine Mammals of the American Society of Mammalogists, may be obtained by writing the author.

THIS MONTH'S COVER

The dramatic close-up of a mandrill appearing on this month's cover won an honorable mention in the 18th Chicago International Exhibition of Nature Photography on display at the Museum through February 24. The photographer is Friedrick Mikula of Vienna, Austria. Included in the exhibition, the largest of its kind in the world, are more than 120 prints and nearly 600 slides, projected for the public at two free showings—Sunday, February 3, and Sunday, February 10, at 2:30 P.M. in the James Simpson Theatre.

Silver medals for the most outstanding print and slide entries were awarded this year to: Prints —Frank L. Youngs (Pittsfield, Massachusetts) and Fred E. Unverhau (Danbury, Connecticut), winner of two medals; Slides— Miss Sherry Ballard (Montara, California), Mrs. Beatrice Petersen (Niagara Falls, New York), and Dr. Walter H. Pinkham (Santa Barbara, California).

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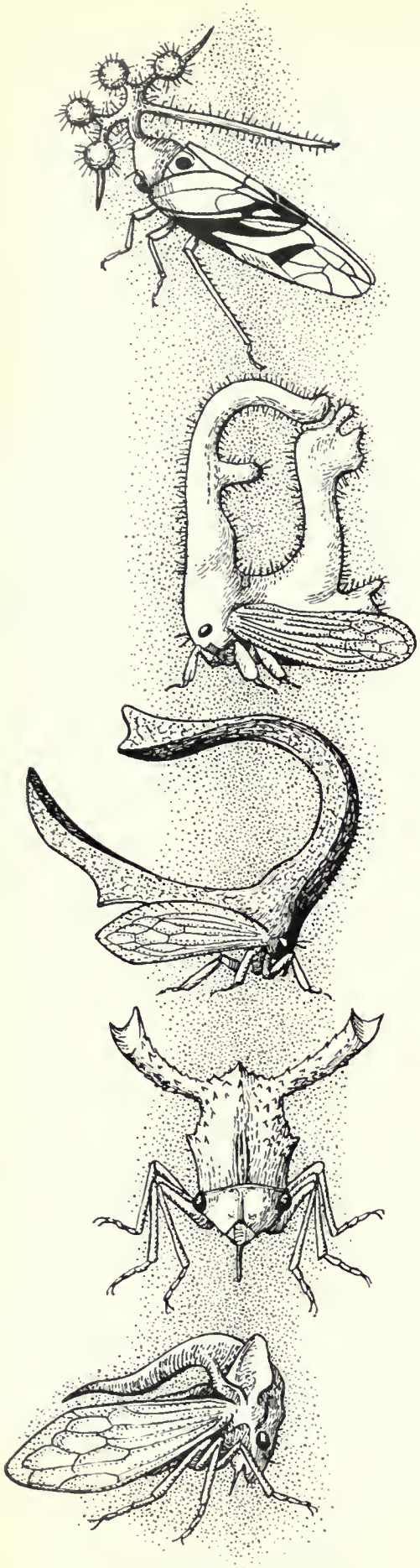
CHICAGO NATURAL HISTORY MUSEUM
Bulletin
Vol. 34 No. 3
March 1963

MALE STAG BEETLES LOCK HORNS IN BATTLE
From "The Insect World" — Featured Exhibit for March



Tropical treehoppers. Drawing by Marion Pahl from "The Insect World."

This month's cover shows two European stag beetles battling over a female. The scene is part of a new exhibition, "The Insect World," which illustrates the diversity of form and habit of the major groups of insects. Among the many kinds shown are the familiar, the rare, the bizarre, the beautiful, and the exotic. How insects exploit nearly every possible environment is graphically illustrated. The exhibition is planned in three sections: the first two are now on display in Hall 18 as the Museum's featured exhibit for March. The third and last section is scheduled for completion later this spring.

INSE

ASSO

A COMMON question about insects is "How many kinds are there?" The question would appear to be perfectly straightforward but, unfortunately, it is not easy to answer even when we modify it to, "How many kinds have been named and described?"

Since the time of Linnaeus, two centuries ago, insects have been named and described in hundreds of technical journals published in many parts of the world in a number of languages. In some cases, the same insect may have been described several times under different names. Again, different species may be masquerading under the same name. It is easy to see how such a situation can cause confusion—different written accounts about an insect that transmits disease, say, may not really refer to the same insect at all. It is one of the continuing tasks of entomologists to evaluate and to synthesize the scattered, uneven work of the past and to monograph and catalogue the various groups of insects. Since entomologists, alas, are hopelessly outnumbered by the insects, the work proceeds slowly, except in certain groups like mosquitoes, for example, where public health problems furnish a special urgency (as well as the required financial support).

Present figures on the number of described species of insects, then, can be no more than rough estimates. In current publications these estimates range from 650,000 to about 1,000,000, with 850,000 species being a reasonable guess. This exceeds the number of all other described animals, as well as all species of the plant kingdom, combined. Moreover, new species are continually turning up, and it is evident that the job of cataloguing the insects that share the earth with us is very far from complete. Estimates of the total number of species—undescribed as well as described—range from a low of two million to a high of ten million! Insects, clearly, are an eminently successful group.

Every continent is inhabited by insects, even Antarctica where, as a matter of fact, insects are the largest land animals. They have successfully adapted to life in forests, grasslands, deserts, and fresh waters. They live underground, on the surface, in the upper strata of forests. Every imaginable way of life seems to be represented. Some kinds live only in ant nests, or feed only on the leaves of one special kind of plant. Others live in the fur of beavers, or in hot springs where the water is 120°F, in salt lakes, or even in petroleum seeps. The insect world is one of astonishing adaptations to precise and unusual modes of life. It is endlessly fascinating.

Why are insects so successful? Biologists have long speculated on this question. For one thing, the insect body plan appears to be one of Nature's most adaptable inventions. The external skeleton, made of chitin impregnated with other materials, is light and strong. It protects the internal organs against injury and desiccation (the great hazard of terrestrial life), and is mechanically efficient. The number and arrangement of appendages seems a happy compromise. Having three pairs of legs makes

THE
T WORLD

NRY S. DYBAS
TE CURATOR, INSECTS

it possible for one pair to be modified for special purposes like digging or grasping, without impairing the locomotory abilities of the animal. With relatively slight modifications, the insect body plan can serve for life under water, for instance, as well as in the harshest desert environment.

By any standards, mammals are also a successful group of animals. They are geographically co-extensive with the insects, and have invaded the same habitats. Like the insects, mammals burrow underground, run on the surface, climb trees, fly in the air, and swim in the waters. They even inhabit the seas, the one habitat in which insects are unaccountably unsuccessful. The mammals, however, "exploit" their environment with only about 3,200 species (or modes of life) as contrasted with the 850,000 already described species of insects. One of my colleagues at the museum accuses me of a kind of "gamesmanship" in contrasting these figures. I hasten to deny any intent at invidious comparison—some of my best friends are mammals—yet it is instructive, I believe, to compare the different ways in which mammals and insects exploit the same environments.

It is clear that insects have subdivided their environment, so to speak, into more kinds of living places and have evolved much more specialized ways of life than have the mammals. One kind of mosquito, *Wyeomyia smithi*, lives only in insectivorous pitcher plants in the United States. A tineid moth, related to our clothes moths, lives only in the fur of living sloths in the American tropics; and so on.

There are many reasons, some of them quite obvious, why insects can be more narrowly specialized in their modes of life than can mammals. There is size, for example. Although some insects, like the giant Goliath beetles of Africa, are larger than small mammals like mice and shrews, most insects are much smaller. Their mean size is probably considerably less than a quarter of an inch. In contrast to the giant beetles, the smallest beetles known are less than 1/75 of an inch long. It would take 23,000,000 of these microscopic featherwing beetles to weigh as much as a Goliath beetle, yet they have all the structures of their giant relatives—compound eyes, many-segmented antennae, flying wings, complex mouth parts—packed into a tiny space smaller than the size of many single-celled Protozoa.

Miniaturization on such a scale is presently beyond the wildest dreams of the space engineers. It opens to the insects a world of special living spaces and ways of life that are not available for larger animals like the mammals. For example, small insects can be supported by scant and specialized food supplies—the tiny featherwing beetles mentioned feed only on growing spores in the microscopic spore tubes of shelf or bracket fungi. In fact, some of these tiny beetles will live only on one particular kind of fungus and not on any other.

Another example of a specialized food supply is the nectar and pollen of flowers. These scattered, tiny parcels of food can be exploited by insects through the use of another adaptation—flying wings. Insects are the only invertebrates that can fly. Many thousands of kinds of wild bees, for instance, have been able to evolve in association with blossoms. Wings help insects to find their mates, escape enemies, locate food, and clearly are an important element in the success of insects as a group.

Many insects go through several stages of life, often in very different kinds of habitats. The dragonfly, for example, spends its early life as a fierce predator under water and then climbs a plant stem into the air and changes into a marvelously graceful and skillful flier. This transformation is analogous to a submarine shedding some of its riveted plates and emerging into the open air as a gleaming jet plane. Such drastic change of body form, called "complete metamorphosis," permits insects to exploit different environments at different times in their life with the most efficient

A common green katydid—songster of the summer night. Photograph by D. Dwight Davis on display in "The Insect World."

(*Continued on page 8*)

CHICAGO NATURAL HISTORY MUSEUM *News*

Photographic Exhibit Shows Southwest Indian Life

Indian life in the Navajo and Hopi country of the Southwest is the subject of a photographic exhibit which opened March 1 in Stanley Field Hall and will continue through the 31st. The 58 black-and-white photo enlargements were taken by Elizabeth Compton Hegemann in the 1920's and early thirties when she lived in the Southwest and traded at the Shonto Trading Post in the high mesas west of Tsegi Canyon.

"My thought was to catch a true reflection of the reservation life around me, among the Navajos and Hopis," comments Miss Hegemann. Her pictures capture the excitement of traditional ritualistic observances like the Entah (square dance) and the Rabbit-skin Robe and Niman Kachina ceremonies; the ordeal of moving herds of goats across the treacherous Colorado River; the eagerly anticipated arrival of a Harvey Car at a Hopi trading post; portrait studies of contemporary Hopi and Navajo tribal leaders; the Shonto Trading Post at sheep dip time; and many other scenes that shed light on the American Indian and his historic past.

Raymond Foundation Contributes To Children's Television

A reminder to Museum Members seeking worthwhile children's television programming: staff members of the Museum's Raymond Foundation have been participating on a regular basis on two television programs—Lee Phillip's "Friendship Show," broadcast each Saturday morning at 7:30 on Channel 2, and WTTW's "Totem Club" on Channel 11 Monday through Friday at 5:15 P.M.

The Foundation's contributions to "Totem Club" have been especially prepared for hard-of-hearing and deaf children.

New Museum Exhibits in Preparation for Chicago's "Space Month"

A series of new exhibits on "Space Geology" is being prepared by the Museum for display during Chicago's official celebration of Space Month (April–May, 1963).

A historical diorama will illustrate the steps in the progress of man's knowledge of outer space, beginning with the mathematical computations of the ancient Greeks; continuing with the invention and use of the telescope, astro-photography, and radio-astronomy; and culminating in personal exploration by man himself.

As use of these methods increases our knowledge of the geology of the moon, we can predict with greater accuracy what kind of landscape our astronauts will encounter when they accomplish the first lunar landing. The Museum's Space Month exhibits will focus on the physical features of this landscape—the most prominent being the enormous craters that pit the moon's surface. How these were formed will be graphically explained, and one of the larger craters on the moon will be reproduced in an exact, nine-foot scale model.

A group of meteorites—first messengers to reach the earth from outer space—will be displayed, the largest weighing 3,300 pounds. Also featured are tektites—objects of black glass formed by the tremendous heat of a meteoritic impact—and the various kinds of rocks to be found on the moon.

Completing the Space Month exhibits will be an eight-foot photographic blow-up of the visible half of the moon, and the most recent large-scale maps of lunar physiographic and geological zones.

The exhibits and a special Soundtrek commentary are now being prepared under the direction of the Museum's Department of Geology, headed by Dr. Rainer Zangerl. Formal opening has been scheduled for April 11 by the Chicago and Midwest Space Month Committee, of which Chicago Natural History Museum is a participating agency. Museum Members will have a special opportunity to see the new exhibits on Members' Night, scheduled for Friday, April 26.

Central American Field Study Continues

Dr. Louis O. Williams, Curator of Central American Botany, has resumed his field work in Guatemala in connection with the Museum's continuing research program on the flora of that country. Dr. Williams plans to work from four to

Prehistoric maste

"PREHISTORI

New Museum

The new children's Journey for March, April, and May will take youngsters into the fascinating realm of archaeology, to meet "Prehistoric Americans."

Young Museum Journeyers will first test their own detective abilities, using the methods by which archaeologists "read" unwritten history. Then their Journey through time starts 20,000 years ago, with the discovery of America by Ice-Age hunters from Siberia. Following a charted path through Hall 4, "Indians Before Columbus," junior explorers will find elephant-hunters in Chicagoland and will meet the Woodland hunt-

five months collecting plants from a relatively little known region of northwestern Guatemala. Sr. Antonio Molina R., botanist of the Escuela Agricola Panamericana in Honduras, will join Dr. Williams in the field.

Additional Program in Free Concerts Series

The final concert in the Free Concerts Foundation's 1962–63 series will be held on Tuesday, April 16, at 8:15 P.M. in the James Simpson Theatre. The program is to be announced.

nters of Illinois

AMERICANS"

ey for Spring

ers and farm villagers who were the ancestors of historic tribes of the midwest—focusing on Illinois: the Shell Mound People, Hopewellians, and the builders of giant mound-cities in the Mississippi Valley.

Journey instructions and questionnaires are available at the Information Desk and at the north and south doors. Completed question sheets must be deposited in barrels located at both entrances in order to receive credit leading to Journey awards, which are based on the number of Journeys successfully completed.

Panel to Discuss "Silent Spring" on March 13

Museum Members are cordially invited by the Adult Education Council of Greater Chicago to hear Dr. Rupert L. Wenzel, Curator of Insects, in a panel discussion of the controversial new book, *Silent Spring*.

Several points of view toward the problems raised by the use of chemicals in controlling insects and other pests will be presented during the program. Deploring the "extreme position, sometimes unrealistic and uninformed," taken by both the supporters and opponents of Miss Carson's thesis, Dr. Wenzel has stated that "it is little wonder that the public—not competent to judge the technicalities, but entitled to explanations—is confused and rightfully alarmed."

Speaking in opposition to Miss Carson's thesis as to the dangers of chemical control will be Mr. Louis A. McLean, Secretary of the Velsicol Chemical Corporation. A third member of the panel, Dr. Lawrence Gilbert, Associate Professor of Biological Sciences at Northwestern University, will suggest a possible alternative to the use of chemicals "through biological control by bacteria and viruses which can kill specific insect pests but have no effect on higher organisms." He will present some of his own research in the use of juvenile hormones to prevent insects from reaching maturity and will review other pioneering experiments that may lead to biological control. Ample opportunity will be allowed for questions from the audience.

The program will be held on March 13 from 7 to 9 P.M. in the Adult Education Council headquarters at 332 S. Michigan Avenue (Room 462). There is a charge of $1.00 for those who are not members of the Council.

Museum Hours

In March and April, the Museum will be open to the public from 9 A.M. to 5 P.M. every day of the week.

Chicago Natural History Museum
Founded by Marshall Field, 1893
Roosevelt Road and Lake Shore Drive, Chicago 5
Telephone: WAbash 2-9410

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Members are requested to inform the Museum promptly of changes of address.

Cetacean Research

Dr. Joseph Curtis Moore, Curator of Mammals, has been invited to participate in a symposium on International Cetacean Research to take place in Washington, D. C., in August, 1963. Dr. Moore will review those species of a polytypic genus of the beaked whale family, *Ziphiidae*, which live in North American waters. His paper will be presented in the systematics, distribution, and natural history session of the symposium.

Saturday Films For Adults

The Spring series of film-lectures for adults continues through April 27. The lectures are presented on Saturday afternoons at 2:30 P.M. in the James Simpson

(*Continued on page 8*)

Drawing by Gustav Dahlstrom

A Maple Sugar Camp

200 years ago

GEORGE I. QUIMBY

CURATOR, NORTH AMERICAN ARCHAEOLOGY AND ETHNOLOGY

MAPLE sugar was a very important food among the somewhat acculturated Chippewa Indians who lived in northern Michigan during the latter half of the eighteenth century. For about one month of each year the principal part of the Indian diet was maple sugar, and a well-known fur trader of the period, named Alexander Henry, wrote, "I have known Indians to live wholly upon the same, and become fat."[1]

Maple sugar and maple syrup were made in the early spring. Chippewa families returning from their winter hunting grounds in the interior parts of the lands they inhabited would spend a month or so at a sugaring camp usually located in a spot not far from the shores of Lake Michigan, Lake Huron, or Lake Superior. Then, with the furs and dried meats obtained on the winter hunt and any surplus of maple sugar produced in the spring, they would journey by canoe to their summer villages located near trading posts, where they could exchange their wealth for the manufactured goods of the white men.

The proper time for sugaring was well described by Henry, who with seven Indian friends comprised or formed a Chippewa sugaring camp near Sault Ste. Marie, Michigan, in late March of 1763. "The earlier part of the spring," wrote Henry, "is that best adapted to making maple-sugar. The sap runs only in the day; and it will not run unless there has been a frost the night before. When in the morning there is a clear sun, and the night has left ice of the thickness of a dollar, the greatest quantity is produced."[2]

Henry also described the sugaring process, in which he participated: "A certain part of the maple-woods having been chosen . . . a house, twenty feet long and fourteen broad, was begun in the morning, and before night made fit for the comfortable reception of eight persons and their baggage.

"The next day was employed in gathering the bark of white birch-trees, with which to make vessels to catch the wine or sap. The trees were now cut or tapped, and spouts or ducts introduced into the wound. The bark vessels were placed under the ducts; and, as they filled, the liquor was taken out in buckets and conveyed into reservoirs or vats of moose-skin, each vat containing a hundred gallons. From these we supplied the boilers, of which we had twelve of from twelve to twenty gallons each, with fires constantly under them, day and night. While the women collected the sap, boiled it, and completed the sugar, the men were not less busy in cutting wood, making fires, and in hunting and fishing.

"On the twenty-fifth of April our labour ended, and we returned to the [trading post], carrying with us . . . sixteen hundred [pounds] weight of sugar. We had, besides, thirty-six gallons of syrup; and during our stay in the woods we certainly consumed three hundred weight [of maple sugar]. Though, as I have said, we hunted and fished, yet sugar was our principal food during the whole month of April."[3]

In about one month during the spring of 1763 Alexander Henry and his Indian friends had produced almost one ton of maple sugar and 36 gallons of maple syrup. According to the estimates of Dr. Wilbert B. Hinsdale,[4] about two pounds of maple sugar per day is sufficient food for one adult. On this basis the group of which Henry was a part produced enough maple sugar to sustain them for 118 days.

They must have collected tremendous quantities of maple sap. Since it takes about 50 gallons of sap to make one gallon of syrup, the 36 gallons of syrup mentioned by Henry must represent 1,800 gallons of sap. Since it also takes about 50 gallons of sap to make eight pounds of sugar, the 1,900 pounds of sugar listed by Henry must represent some 11,875 gallons of sap.[5] Thus the Chippewa Indian women in Alexander Henry's group must have collected about 13,675 gallons of maple sap in the spring of 1763.

To obtain this amount of sap it probably would have been necessary for the Indians to tap some 700 or more maple trees. And since it takes one cord of wood to produce eight to ten gallons of syrup in a modern evaporator, the Indians and Alexander Henry must have had to collect the equivalent of at least thirty cords of wood for their twelve boilers that had fires constantly under them day and night.[6] As Henry has indicated, the men cut the wood for the fires and the women collected the maple sap and boiled it into syrup and sugar.

The transportation of the surplus sugar and syrup to the Indians' summer village or a trading post must have presented somewhat of a problem. A gallon of syrup should weigh about 11 pounds; thus the 36 gallons of syrup produced by Alexander Henry and his friends should have weighed 396 pounds. With the weight of the syrup added to the 1,600 pounds of sugar they produced, there was a total of 1,996 pounds of maple products that had to be transported by eight persons. This was a load of more than 200 pounds per person. If they also transported their sugaring kettles and other equipment they must have made several trips between their sugaring camp and the trading post at Sault Ste. Marie.

The sugar and syrup produced by the Chippewa in the second half of the eighteenth century constituted about one twelfth of the annual diet of many Chippewa families. In addition, the surplus of these products was bartered at trading posts or possibily exchanged for corn with the Ottawa. For these reasons, maple sugar and syrup were extremely important in the Chippewa economy during this period.

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[1] Henry, Alexander. *Travels and Adventures in Canada and the Indian Territories between the Years 1760 and 1776* (Bain edition, Toronto 1901), p. 71.

[2] Ibid., p. 70.

[3] Ibid., pp. 70–71.

[4] Hinsdale, Wilbert B. "Distribution of the Aboriginal Population of Michigan," *Occasional Contributions from the Museum of Anthropology of the University of Michigan*, No. 2 (Ann Arbor, 1932), p. 9.

[5] Panshin, A. J.; Harrar, E. S.; Baker, W. J.; and Proctor, P. B. *Forest Products: Their Sources, Production, and Utilization* (New York, 1950), pp. 466–468.

[1] Ibid., pp. 466–468.

EXPEDITIONS 1963

FISHES from the Indian Ocean; Central American plants threatened with extinction; 400-million-year-old fossils and prehistoric Indian pottery from the American West; an extremely rare emergence of destructive insects in southern Illinois—these are some of the objects and events of natural history that will be studied on expeditions and field trips by scientists from Chicago Natural History Museum during 1963.

During the past three decades, through the work of Dr. Paul S. Martin, Chief Curator of Anthropology, the history and ways of life of several groups of prehistoric peoples living in east-central Arizona from 5000 B.C. to A.D. 1400 has been gradually unfolded. Dr. Martin expects to leave for the field in May to continue his studies.

In Wisconsin, Michigan, and Ontario, Mr. George I. Quimby, Curator of North American Archaeology and Ethnology, will search for sites inhabited by Indian tribes of the 16th, 17th, and 18th centuries. Mr. Quimby is especially interested in collecting artifacts representative of a newly-discovered flint-knapping technique that was characteristic of Indians living in the Upper Great Lakes region from 1000 to 1700 A.D.

With a number of other scientists, Mr. Loren P. Woods, Curator of Fishes, will participate in the U. S. Biological Program of the International Indian Ocean Expedition now being planned by the Woods Hole Oceanographic Institute with the help of an advisory panel. One of the vessels to be used in the expedition is the former presidential yacht, now refitted with the latest equipment for collecting and studying marine fauna. Woods expects to collect fishes in the western Indian Ocean from September through April, 1964.

In Central America, the current population explosion has resulted in extensive forest lands being cleared for the cultivation of food—a process that is de-

(*Continued on next page*)

(*Continued from preceding page*)
stroying more and more of the native plants. A new two-year grant from the National Science Foundation will enable Dr. Louis O. Williams, Curator of Central American Botany, to collect Central American botanical specimens while they are still available, in preparation for future floristic and taxonomic studies. Dr. Williams is now in Guatemala, and will collect Nicaragua and Costa Rica before returning to the Museum in May.

BULLETIN readers will recall last month's article by Dr. Joseph Curtis Moore, Curator of Mammals, on the world distribution of one species of the rare beaked whales. Dr. Moore has personally studied, measured, and photographed 43 specimens of these mammals from 12 museums in that many North American cities and universities. Beginning in September, he will make similar studies of specimens in museums in London, Edinburgh, Leiden, Caen, Paris, and Rome in Europe; Capetown and Port Elizabeth in South Africa; Perth, Adelaide, Melbourne, and Brisbane in Australia; Auckland, Wanganui, Wellington, Christchurch, and Dunedin in New Zealand; Tokyo, Japan; and Honolulu, Hawaii. Eventually Dr. Moore hopes to establish with certainty the number of beaked whale species, what differences really distinguish them, and the degree of relationship between the species.

Two field trips to our own far West are scheduled for summer. Dr. Robert H. Denison, Curator of Fossil Fishes, and Mr. Orville L. Gilpin, Chief Preparator of Fossils, will return to the Big Horn Mountains of Wyoming where museum parties have collected important specimens of Devonian fossils in recent years. Among these is the oldest ancestral relative of a modern "living fossil," the lungfish. Also traveling west —to the Black Hills of Wyoming—is Dr. Bertram G. Woodland, Curator of Igneous and Metamorphic Petrology. Woodland plans to make a detailed study of the minor structural features of a small area of the metamorphic rocks, with a view to establishing their structural history.

The year 1963 marks a once-in-a-life-time opportunity for research on the biology of periodical cicadas in the Mississippi Valley region because of the scheduled joint emergence in May of both the 13-year and the 17-year cicadas. The last time these two groups of economically important insects emerged together was in the year 1742. The next similar opportunity will not be until the year 2184! Under a grant from the National Science Foundation, Mr. Henry Dybas, Associate Curator of Insects, will study this unusual phenomenon, in collaboration with Dr. Monte Lloyd of the University of California (Los Angeles).

The list of official expeditions and field trips for 1963 by no means exhausts the continuing work being done by Museum research associates and collaborators in many parts of the world. In addition to a number of short study trips planned by the staff to nearby localities, research and collecting will continue under the Museum's aegis in Iran, Borneo, the Philippines, Nepal, Southern Rhodesia, the Lord Howe Islands, Malaya, southern Thailand, and many parts of Central and South America.

The Insect World—

(*Continued from page 3*)
body design for each. An adult fly is poorly designed to crawl inside a decaying fruit, but its early maggot stage is ideally adapted to such a "soupy" environment.

Some of these specialized food sources are seasonal, however. Here again the insects have developed a special adaptation called "diapause" (analogous to hibernation in mammals) during which they lie dormant until favorable environmental conditions are present. Diapause may occur in any stage—egg, larva, pupa, or adult. It permits insects to survive unfavorable periods and to synchronize the stages of the life cycle with the appropriate external conditions. For example, an *Aedes* mosquito egg may remain dormant for a year until a rainfall fills the depression in which the egg was deposited, at which time diapause is broken and the mosquito larva hatches.

The world is full of insects and they are inextricably involved in the web of life. Like all other animals, they ultimately depend on the plant kingdom, which traps and fixes the energy of the sun. Marston Bates, in his fine little book, *The Forest and the Sea*, likens the web of life, or the biological community, on this earth, to a "vast and complicated system for sharing and distributing the energy of the sun among a diversity of life forms." Insects, through the adaptations just discussed (and many more), have "cut themselves in" on this system in a multitude of fascinating ways which we are slowly unraveling in our goal of understanding our earth.

Museum News—

(*Continued from page 5*)
Theatre. Following is the schedule for the remaining weeks of March and the first part of April:

March 9—Ecuador's Galapagos Islands

March 16—Around the World

March 23—For Generations to Come
(*Wisconsin's natural history—past, present, and future*)

March 30—Panama, Land of Contrast

April 6—Eternal Rome

Children's Movies Continue

The free movies for children continue on Saturday mornings at 10:30 A.M. Scheduled for the remaining weeks of March and the early part of April are the following programs:

March 9—At Home in the Woods
(*Camp Fire Girl Day*)

March 16—The Bald Eagle, Our National Bird
Cartoon also

March 23—For Generations to Come

March 30—About Time

April 6—Circle of the Sun
(*Museum Traveler Day*)

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CHICAGO NATURAL HISTORY MUSEUM

Bulletin

Vol. 34 No. 4

April 1963

New HALL *of* USEFUL PLANTS *now being installed*

BEGINNING more than a year ago with the bricking-in of windows, Museum workmen have been preparing Hall 28 on the second floor for installation as a new Hall of Useful Plants.

Last April, when about half the construction work had been done, Museum Members were invited to inspect progress to that time. Now the major construction work is finished, and, of the more than a hundred new exhibit units planned, about one-third have been installed.

On April 26 this year, Members may have another look at progress made in the new hall. After Members' Night, the hall will remain open, while the remainder of the exhibits are finished, to provide free movement of visitors throughout that portion of the second floor and also to permit immediate use of completed exhibits by school groups and others.

Among the cases recently installed is one on gums and pectins. Both groups of substances are complex carbohydrates known as polysaccharides. They occur in greater or lesser amounts in many kinds of plants. Gums and pectins absorb water in varying degrees. Some dissolve to form a colloidal or mucilaginous liquid. Others simply swell in water without going into solution unless heat is applied, after which, when cooled, they form a gel. Most gums are digestible; some are not, being resistant to all the digestive enzymes in the human tract. Psyllium is an example.

The colloidal nature of gums and their individual differences in solubility, viscosity, and stickiness make them useful in a wide variety of food, pharmaceutical, and industrial preparations in which gums act as emulsifiers, stabilizers and extenders, or add desirable textural qualities. Gums have little or no taste of their own; hence one is not aware of the numerous instances in which they are encountered in daily living. However, one has only to examine the labels on many brand name salad dressings to find the words "gum tragacanth" or "vegetable gum and algin derivative added." Process cheeses, soups, and meat products also are likely to contain gums. During the past Christmas holiday season the prepared eggnog drink sold by one large dairy contained three different gums, two natural and one synthetic, the latter carboxymethylcellulose. Candies, pills, and printers inks may contain a gum and

In addition to the exhibit on gums and pectins, described in the accompanying article, the new Hall of Useful Plants contains completed exhibits on spices, plant dyes and tannins, resins, and fibers. The section on spices, part of which is shown above, reproduces more than 40 spice-producing plants, shows the part of the plant from which the condiment is derived, tells where each plant originated or is cultivated, and illustrates the role of spices in western history and culture.

thus the list could be greatly extended. The sources of useful vegetable gums are as varied botanically and geographically as are the applications to which they are put.

The principal natural gums of commerce may be grouped into three categories that indicate the manner in which the gum is obtained or the plant source. Exudate gums are those that ooze from the stems of the producing plant either naturally or from incisions made in stems. Gums arabic and tragacanth are the most important members of this group. Gum arabic is obtained from various North African species of acacia. It has been an article of trade since the first century when the gum was sent to Europe by way of Arabian ports, hence the name. Gum arabic is gathered from both wild and cultivated trees during

(*Continued on page* 8)

...TURES

The space man and monkey shown on the cover, and the amusing figure of Galileo (below), were designed by Dr. Tibor Perenyi, Geology artist, for the Museum's new Space Month exhibits. The photographs are by John Bayalis and Homer V. Holdren, of the Division of Photography.

VISITORS from an extinct planet, an astronaut's view of the moon, and five historic paths to man's knowledge about outer space—are a few highlights from the many events being planned for Members' Night, April 26, 1963.

On this once-a-year occasion, a series of new exhibits on "Space Geology," which opens on April 11 for display during Chicago and Midwest Space Month, shares honors with the new botany hall whose reconstruction is described on the adjacent page. Members' Night is also the Museum's traditional "open house," when visitors are welcome in all laboratories and workshops, and the scientific and technical staffs are on hand to explain their research and other "behind-the-scenes" activities.

Through education and research, the Museum is contributing, with other Midwest institutions, to man's knowledge about outer space. The Museum's research in this field is concentrated on meteorites, the first "messengers" to reach Earth from outer space and our only tangible sources of knowledge about other planets. Scientists of the National Aeronautics and Space Administration have called the study of these fragments that have fallen on Earth "a space probe in reverse." The availability at the Museum of the largest collection of meteorites in the United States, comprising more than 1,600 specimens, presents space geologists with an unusual opportunity for scientific investigation.

Utilizing X-ray, spectographic, and microscopic techniques, Dr. Edward J. Olsen, the Museum's Curator of Mineralogy, in cooperation with Dr. R. F. Mueller, Assistant Professor, University of Chicago, is analyzing the minerals associated closely together in individual meteorites. Some of these are silicon and sulfur-bearing minerals like those found in Earth rocks; others are iron alloys not known from Earth. All show slight variations in composition, depending on the pressure and temperature conditions existing in the interior of the meteorite's parent planet when the minerals were formed.

By applying existing chemical theory to the results of a large series of analyses made of the compositional variations in the minerals, Dr. Olsen expects to reconstruct the original circumstances under which the meteorites must have been produced. Such direct knowledge of how extinct planetary bodies were formed should have an important bearing on our understanding of the origin and internal structure of all planets, including our own.

Based on the latest research in space geology, the new exhibits on display in Stanley Field Hall through May 9 focus on the historic progress of man's knowledge about outer space and suggest how the lunar landscape will appear to the first astronauts to land on the moon.

Dr. Tibor Perenyi, Geology artist, has created a diorama that, in a light-hearted, tongue-in-cheek style, tells the

(*Continued on page 8*)

These beautiful but vanishing Hawaiian tree snails are now found only high in the mountains in tiny patches of native vegetation. Below, a day's catch, shown slightly enlarged. (Photographs by the author.)

Pacific

CURATOR

NEARLY FIVE months in Hawaii, two months in Australia and New Zealand, two months collecting in such exotic lands as Tahiti, Fiji, New Caledonia, Malaya, and Kenya, plus four months in Europe. This is the journey that my wife, Barbara, and I recently completed for Chicago Natural History Museum.

It all started with an interest in snails.

Since receiving my first sea shells from a Sea-Bee uncle stationed on Midway and then Tinian, I've been fascinated by the mollusks of the Pacific Ocean. Over the years my attention focused more and more on the wonderfully diverse but minute land snails—secretive but often colorful dwellers on the forested peaks of the scattered dots of land that make up Hawaii, Tahiti, Bora Bora, and the myriad other enchanted isles of Polynesia and Micronesia. When were the islands colonized by these tiny organisms? How did they arrive? How do they live? What effects have man's introductions had on them? Each set of specimens seen raised yet another query or suggested hints of a new answer or a new problem for consideration.

In 1959, after a number of years of study, I published a review of the Pacific Ocean land snails,[1] which pointed out certain unusual patterns in their distribution, and, like all scientific studies, raised many new points for consideration. One, in particular, seemed worthy of immediate pursuit—trying to determine the time of arrival of certain snails onto the Pacific Islands. People had made various guesses, but there was no evidence to back them up.

Shortly before my review was published, fossil land snails had been reported from the deep core drillings on Bikini, Eniwetok, and Funafuti atolls. All these fossil snails were endodontids, members of perhaps the most widely distributed and least understood family of Pacific land snails. On a study trip to Washington I was able to examine these snails and realized that the fossils, ranging in age from 1,000,000 to 20,000,000 years old, were nearly identical with some of the modern species. By relating the fossil species to the living forms and their distribution, I believed that we could trace what changes have occurred in distributions during the last 20,000,000 years.

Because of a very remarkable Hawaiian, huge collections from nearly every island in the Pacific exist at the Bernice P. Bishop Museum in Honolulu. It was the late C. Montague Cooke, Jr., who sponsored several collecting trips that brought back over 1,000,000 land snails. These had been sorted and labeled. Cooke, his protegé and successor, Yoshio Kondo, and several others have studied parts of these vast accumulations, but the endodontids had not been monographed. Dr. Kondo generously indicated that I would be quite welcome to report on these collections.

In view of the thousands of endodontids at the Bishop Museum (perhaps 30 times the number found in all other collections combined), additional col-

[1] *Fieldiana: Zoology, Vol. 43*

Snail Trail

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lecting could best be postponed until specific problems, suggested by a survey of existing material, were identified. So a three-stage study program was planned: first, to review the collections in the Bishop Museum and select material for later dissection and illustration; second, to try to determine which New Zealand and Australian species were related to the Polynesian and Micronesian species; and third, to compare specimens from recent collections with material collected 80 to 120 years ago and now preserved in European museums.

Both Chicago Natural History Museum and the National Science Foundation approved this project and gave us their generous support. In August, 1961, my wife and I left O'Hare Field, and returned on September 29, 1962, more than a year later. We brought back approximately 750 data sheets filled with measurements, about 850 pages of completed manuscript, nearly 2,000 photographs, and possibly 25,000 specimens either collected by us or on loan. The scientific results of our work will appear in a series of technical reports after several years of further study. Here I can only try to give you some of our impressions of places and peoples, and to convey how we worked on this project, what our methods of study were, and why the emphasis of the research shifted as we progressed.

Hawaii was our first stop. We had all the usual hazy notions of the islands, gleaned from newspaper travel sections —hulas and Waikiki Beach, pineapple and sugar cane, surf boards and the slack key guitar. Once there, however, we were more impressed with the differences in everyday living—soy sauce in the economy quart bottle; rice in 100-pound bags; a sign by an escalator saying "People in bare feet please use stairway"; and the sight of the main streets in a rainstorm with businessmen, school girls, and housewives strolling barefoot, shoes slung over their shoulders to keep them dry!

Most of our time was spent on the third floor of the Bishop Museum, in a large room with steel cabinets full of marine shells, glass front cabinets with unending rows of jars containing hundreds of tiny vials with the soft parts of shells, and tier after tier of flat white boxes filled with pillboxes of land snails. Each pillbox had its own number (there were over 230,000 in all!) and contained one to five hundred snails. Fortunately, there were only 7,500 pill boxes of endodontids. Each number had to be looked up in one of the many catalogues to find out details as to collecting locality and ecological information. Even with our 7:30–5:30 schedule, studying everything was obviously impossible, so we had to concentrate on covering the non-Hawaiian species alone.

I soon had "microscope neck" from steady hours of making four to ten measurements on each adult endodontid, sorting species, recording numbers of specimens from each locality, gradually recognizing the previously named species, and assigning provisional new names to species yet unnamed. Barbara kept busy copying data from the catalogue onto file cards and making statistical calculations from my measurements. Then she typed up additional descriptions and notes which I dictated to her, and compiled data on the range for each species from my rough notes. In spare moments she would trace copies of the maps on which the Bishop Museum had plotted their collecting localities. The pile of completed manuscript pages grew until finally we had covered 240 species and subspecies of endodontids, 150 of them previously unknown to science.

Week ends, weather permitting, provided a welcome chance to leave microscope and typewriter, and get out into the hills to collect. Although I had an intellectual knowledge of the extent to which the original environment of the islands had been altered, it was a shock to see how small and scattered the stands of native forest are, and how few land snails remain. At times specimens taken by five people searching all day could easily be held in one hand. Probably in 50 years, at most, they will be extinct on Oahu, and they will last only slightly longer on the other islands.

By early January we had completed our survey, packed up a large loan and exchange shipment, bottled several hundred soft parts for dissection back in Chicago, and were faced with a crisis. How to compress our clothing for the next nine months into two suitcases, and, with a typewriter, microscope, and manuscript, still stay within the 44 pounds allowed each person for luggage? We came amazingly close, but still occasionally had to pay excess baggage fees.

Tahiti, Fiji, and New Caledonia were on direct airline service between Hawaii and New Zealand. We planned brief collecting stops in each place, both to gain some familiarity with local conditions and to see whether these areas would be suitable for a subsequent major collecting program. Bishop Museum collectors had visited both Tahiti and Fiji in the 1930's, so here was a chance to revisit the same localities sampled almost thirty years earlier. Unfortunately, civilization had preceded us, and in Tahiti we found that all of our plotted localities were now cultivated land without native snails of any kind.

In Fiji, we located on the south coast of Viti Levu, a three-hour, 40-mile drive from the airport. Our accommodations were a fishing shack containing a kerosene camp stove and fronting on a magnificent fringing reef. When the land localities here also proved to be cultivated, we turned to the reef and collected and photographed extensively.

(*Continued on page 6*)

CHICAGO NATURAL HISTORY MUSEUM *News*

Spring Programs Continue

The Museum's spring series of film-lectures for adults continues throughout April with a different program scheduled every Saturday at 2:30 P.M. in the James Simpson Theatre.

Children's film programs also will be offered each Saturday morning during April (with the exception of Easter Saturday, April 13) at 10:30 A.M.

All programs are free.

Museum "Journeyers" To Receive Awards

In the spring of 1955, the Museum began its Journey program, designed by the Raymond Foundation to help individuals, especially children, get started in seeing and discovering things of interest in the Museum.

Since that time, nearly 50,000 Journeys have been taken, not only by individual children, but by families, school classes, Girl Scout troops, Camp Fire Girl groups, and other groups. Of this total, 9,986 Journey questionnaires have been turned in for credit in the Raymond Foundation's Journey Award program. In the last eight years, 357 Traveler Awards have been presented to children completing four different Journeys; 158 boys and girls have been given Adventurer Awards for making 8 different Journeys; 75 Explorer Awards have been made for finishing 12 Journeys; and 31 youngsters have become members of the exclusive Discoverers' Club by completing 16 different Journeys and then taking a special Journey that follows closely, in Museum exhibits, Darwin's famous voyage on *H. M. S. Beagle.*

At the Journey Award program to be held in James Simpson Theatre on April 6, 83 youngsters will join the roster of those honored as successful Museum Journeyers. Those receiving the highest award, membership in the Discoverers' Club, are: Timothy Behrens, James E. Dimitrious, Carl Helfrich, Glenn T. McDavid, John R. Raines, Barbara Stekly, and Lillian Stekly.

Final Free Concert April 16

Pianists Gold and Fizdale will be joined by Marie Montealegra (Mrs. Leonard Bernstein) on the stage of James Simpson Theatre on Tuesday, April 16, 8:15 P.M., for the Free Concerts Foundation's final program of its 1962–63 concert series.

Mrs. Bernstein will provide commentary for the compositions to be performed, a program that the three artists presented for the first time on the occasion of the dedication last year of the new Lincoln Center in New York.

Free tickets for the concert may be obtained by sending a stamped, self-addressed envelope to Free Concerts, Chicago Natural History Museum, Roosevelt Road at Lake Shore Drive, Chicago 5.

New Staff Appointments

The recent appointment of Dr. John Clark to the staff of the Department of Geology adds a new curatorship to the Museum's scientific roster, that of Associate Curator of Sedimentary Petrology.

Dr. Clark, originally from Chicago, left a position as director of research and development for the Black Hills Clay Products Company in Belle Fourshe, South Dakota, to come to the Museum. Other positions he has held in his geology career include an assistant professorship in geological engineering at the South Dakota School of Mines and Technology and the post of Curator of Geology at the Cleveland Museum of Natural History.

Dr. Clark received his doctorate, as well as a master's degree, in geology from Princeton. He also has a master's degree from the University of Pittsburgh, and a bachelor of science degree from the University of Illinois. He is a member of the Geological Society of America, the Paleontological Society, and the Society of Vertebrate Paleontology.

Dr. In-Cho Chung, formerly a member of the science faculty of Bloomfield College in New Jersey, has been appointed Assistant Curator of Vascular Plants in the Museum's Department of Botany. Dr. Chung, who attended the University of Tokyo and Seoul National University in Korea, completed his graduate work at the University of Michigan where he received his doctorate. From 1955–1958 he served as instructor of oriental languages in the U. S. Army Language School in Monterey, California, and was professor of botany, general biology, and genetics at Bethune-Cookman College prior to his appointment to Bloomfield College. His publications include a paper on Korean

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grasses, and a study of the vegetation of Ullung Do (Dagelet Island), Korea.

In his present position, Dr. Chung will strive to increase the usefulness of the herbarium as a research tool and will undertake studies of tropical American plants in furtherance of the Museum's long standing interest in the New World tropics.

Mr. Lido Lucchesi, who for the last 10 years has been a free lance artist–craftsman specializing in the execution of architectural models, mold-making, and casting, has been added to the staff of the Museum's Harris Extension as a preparator of traveling exhibits. Lucchesi, whose appointment was effective January 1, is a Chicagoan.

The Harris Extension, directed by Mr. Richard A. Martin, is that division of the Museum responsible for the construction and distribution of traveling exhibits which are circulated without charge to approximately 500 Chicago schools each year.

Another staff addition to the Harris Extension since the first of the year is Mr. Ronald J. Lambert, formerly a fossil preparator in the Department of Geology. Lambert has been with the Museum 16 years, three years in the Department of Geology and 13 years in taxidermy.

Mr. Leonard Carrion, Museum Chief Engineer, has been selected by the Board of Education to teach a new vocational course in plant engineering created especially for firemen and building superintendents of Cook County schools. The course is being offered this spring at Leyden Township High School in Franklin Park.

In Memoriam

Miss Edith M. Vincent, botany librarian and secretary for 39 years, died on Saturday, March 9, at the age of 78.

Miss Vincent came to Chicago Natural History Museum in 1924 after having served for 17 years as assistant librarian for the Gray Herbarium at Harvard University. A graduate of Radcliffe, her never-failing memory for facts and circumstances relating to books in the botanical library was a source of constant amazement to all who worked with her. Nominally retired in 1945, she continued on as research librarian until her death. Her soft-spoken manner and dedication to the Museum will be greatly missed.

The Museum regretfully reports, also, the death of Dr. Marie Pabst, 53, a guide-lecturer for the Raymond Foundation from 1936–1946. For the last 15 years Dr. Pabst has been a faculty member in the department of geology at Western Washington State College. She was a graduate of the University of Minnesota and received her Ph. D. in paleontology from the University of California at Berkeley.

Coming Exhibits

Young artists' impressions of Chicago Natural History Museum exhibits will be on display in the Museum May 1–31 in the annual spring exhibition of the Junior School of the Art Institute. Exhibited will be drawings, paintings, fabric designs, and transparencies executed by art students aged five to 18.

Hundreds of exhibits relating to biology, geology, astronomy, matter, and energy will make a one-day appearance at the Museum on Saturday, May 11, when the 13th Annual Chicago Area Science Fair brings together young scientists from all over the city and its suburbs for a demonstration of student science comprehension and application.

Representing public, private, and parochial schools in the Chicago area, the students will be prepared on that day to explain their demonstrations and displays to all visitors.

The young exhibitors will range from 6th graders to seniors in high school, and are chosen to participate through preliminary competitions in their schools.

Awards will be presented at the end of the day on the basis of the student's knowledge of his project and on the attractiveness and originality of his exhibit. The fair is sponsored by the Chicago Area Teachers Science Association.

Pacific Snail Trail—

Continued from Page 5

In New Caledonia we found good tracts of accessible forest and enjoyed our first French style field trip. Before going into the forest at 8:30 A.M., we were told to return to a rendezvous point at 11:30. We arrived to find salad, omelet, fruit, wine, chilled beer, bread, china, silverware, and linen napkins nicely arraigned on a tablecloth spread out by the stream-side. I leisurely picked native snails off the trunk of a tree that formed my backrest during lunch! Similarly, at 4:30 everything stopped for freshly brewed coffee. While this was totally different from our usual field trips, it was a charming experience, and New Caledonia produced our best and most extensive collections of specimens.

What had our month of field work on the islands produced? A depressing realization that more than half the fauna I was so interested in is now extinct and that access to the remnants would require the instincts of a mountain goat. New Caledonia is seemingly the only island where extensive native forest is still accessible and it thus would be possible to do biological studies on the native snails.

(*To be completed next month*)

MEMBERS' NIGHT FEATURES

HALL OF USEFUL PLANTS—(*Continued from page 2*)

dry seasons of the year. It exudes in drops or "tears" naturally or as a result of peeling narrow strips of outer bark from trunks and larger branches to expose the cambium layer.

Gum tragacanth is obtained in the form of curled, translucent, ribbon-like flakes exuded from the stems of small shrubs belonging to the genus *Astragalus* and widely distributed throughout Asia Minor and Iran. Tragacanth does not dissolve in water but instead swells to form a gelatinous mass. It is used as a component of pills, hand lotions, as a demulcent, and as a size.

Seed gums are the second large category of gums. The seed coat or the seed endosperm are the sources of the gum. The mucilaginous and indigestible coat of psyllium seed is used as a laxative. It is obtained from the Eurasian *Plantago ovata*, a close relative of our common garden weed, plantain. Carob, or St. John's bread (*Ceratonia siliqua*), has been used as both human and animal food from prehistoric times. The tree, native to Mediterranean regions and known also as algaroba, has been planted in other warm climates including California and Florida. The copious endosperm of its seeds is a rich source of one of the more widely used gums known as locust seed gum.

Seaweeds are the source of a number of gums of differing characteristics. Agar, obtained from red algae (principally from species of *Gracilaria* and *Gelidium* found in Japanese waters), forms the basis of standard culture media in bacteriological and other laboratories. Carageen gum from Irish moss, *Chondrus crispus*, gathered at low tide along the north Atlantic seaboard of the United States and Canada, has long been used for culinary purposes (puddings) and as a size for textiles.

More spectacular has been the development in recent decades of machinery to harvest the brown alga *Macrocystus pyrifera* in the Pacific off the coast of California. This giant kelp has become the principal source of algin, a gum, although the kelp originally was gathered as a source of the element iodine. Giant kelp grows attached by a holdfast to the sea bottom and attains a length variously stated as from 200 feet to 200 meters in length. Strap-like blades resembling leaves attain a width of one foot and a length of ten or more feet. These are attached along the upper portions of the stem and are kept floating near the surface of the sea by bladder-like expansions of the kelp stem.

Algin gums extracted from seaweeds have found wide application in food products, candies, pharmaceuticals, and cosmetics. If your dish of ice cream is especially smooth, does not collapse and run off the plate, you may give credit to one or more of the vegetable gums.

Pectin, protopectin, and pectic acid are important constituents of the cell walls of plants. Of the three, only pectin forms a viscous solution in water. Commercial sources of pectin are citrus peel and apple residue from cider making. Under proper conditions and in the presence of large amounts of sugar, pectin solutions will set into firm gels. This is what happens in the kitchen when sweetened fruit juice containing enough pectin is boiled and then allowed to cool.

JOHN R. MILLAR
Chief Curator, Botany

SPACE EXHIBITS—(*Continued from page 3*)

story of man's probing of space. The exhibit begins with Hipparchus, who estimated the motions and relative distances of the planets in ancient times. Continuing with Galileo's invention and use of the telescope to explore the heavenly bodies, and the development of astrophotography and radio astronomy, the diorama culminates in an amusing sculpture (see cover) symbolizing the personal exploration of space by man himself—urged on by his pioneering cousin, the monkey!

The astronaut's view of the moon is conveyed by a series of exhibits illustrating major lunar physical features. A moon crater, 18 miles in diameter, is reproduced in a nine-foot scale model. Other exhibits compare such craters with similar structures on Earth and explain graphically how they were formed by the tremendous impact of falling meteorites or the explosive action of long-extinct volcanoes.

The visitors from an extinct planet are, of course, meteorites. From the Museum's collection many of unusual interest are shown, including the Quinn Canyon iron meteorite weighing 3,300 pounds. Some are cross-sectioned to reveal their inner structure.

Large photographic blow-ups of the moon and the most recent large-scale maps of lunar topographic and geological zones complete the Museum's exhibits for Space Month.

Films about the moon, meteorites, asteroids, comets, and the forthcoming lunar probe will be shown in Hall 9 (first floor, east) on Members' Night. These will be accompanied by brief talks by Dr. Olsen and Dr. Bertram G. Woodland, Curator of Igneous and Metamorphic Petrology, who has also been active in preparing the exhibits on "Space Geology." Dr. Rainer Zangerl, Chief Curator of Geology, is in charge of overall planning for the Museum's contribution to Space Month.

Other events on Members' Night include a display of the newly acquired Bieber collection of Chinese toggles, textiles, costumes, jewelry, folk art, and lion dog representations. This outstanding collection will be shown informally in Room 38 of the Department of Anthropology, located on the third floor of the Museum. Staff members in the Division of Fishes and the Division of Reptiles and Amphibians will greet Members and their guests on the Museum's ground floor. On the third and fourth floors all preparation rooms, workshops, and scientific laboratories will be open. In many of these areas, displays and demonstrations will be set up to illustrate current staff activities in research and exhibition. During the evening, refreshments will be served in the Library on the third floor and in Stanley Field Hall.

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CHICAGO NATURAL HISTORY MUSEUM

Bulletin

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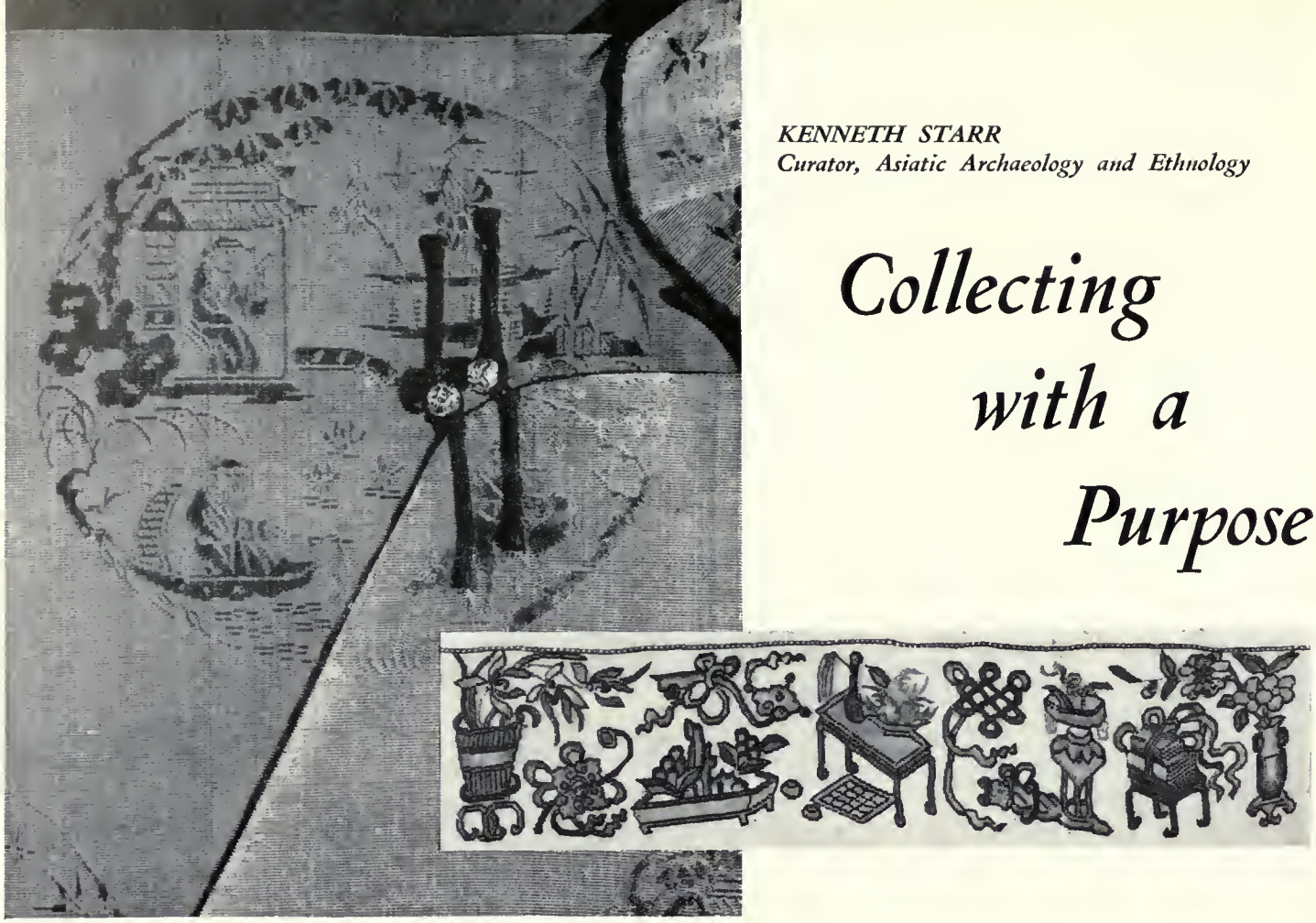
KENNETH STARR
Curator, Asiatic Archaeology and Ethnology

Collecting with a Purpose



Detail from collar area of chartreuse green man's jacket of brocaded velvet

Inset: Sleeve-border from woman's gown with auspicious symbols in petit-point on gauze

Photographs by John Bayalis and Homer V. Holdren

VIEWED IN TERMS of the manner in which they were obtained, materials in museum collections fall into one of two categories. One is represented by materials collected with an intellectual context in mind; the other, of materials collected without such a context.

Specimens acquired by museum expedition normally either fit into some specific research program or augment or supplement existing collections. Those acquired by purchase, even though only one or a few pieces may be involved, also normally are obtained with one of these two ends in view. Objects acquired by gift, however, having been collected by individuals, each with his own criteria—if any—for collecting, are much more rarely endowed with an intellectual context. Such materials often are acquired either as discrete objects or as one of a small group of objects, appreciated as being individually curious or esthetically pleasing. Although such gifts may be welcome additions to the collections, there is the need to fit them into some overall scientific or esthetic pattern. If documentation comes with these isolated pieces, or if their types are well known, this often can be done. Frequently, however, there are no associated data, and the type may be an uncommon one, so that these isolated pieces become of extremely limited scientific value.

Toy tiger

Thus it is that the large and representative group of Chinese folk materials collected by Miss C. F. Bieber and recently acquired by the Museum is quite remarkable, for it was assembled with great purposiveness. The collection consists of more than 1500 pieces, largely characteristic of middle- and upper-class Chinese life, especially as it existed in the Peking area during the latter part of the Ch'ing, or Manchu, Dynasty (1644–1911). The materials are divisible into three groups, as follows:

GENERAL COLLECTION

This group, the largest and the most varied of the three, includes more than 1000 Chinese folk-art and utilitarian objects ranging quite widely in type. They were assembled by Miss Bieber with two purposes in mind, first, to preserve some of the abundant and diverse folk materials that characterized Chinese life during the last years of imperial China and, two, to show the many different substances used to make them, the techniques involved in their manufacture and, finally, the great richness of the symbolism in their decorative motifs. One may break down this General Collection as follows:

Textiles: These are further subdivided into costumes, costume accessories, and a miscellaneous group of materials.

The costumes range from elegant men's robes, including one of dark blue brocaded silk with ermine "horse's hoof" cuffs and fully lined with new-born lamb's wool, through a variety of fine women's and children's robes, gowns, coats and jackets. All are in excellent condition and manifest a very wide range of materials, techniques and colors, and decorative motifs. There also are examples of such diverse elements of apparel as hats, head-bands, ear-muffs, collars, sleeve- and ankle-bands, and shoes.

The costume accessories used in old China and assembled by Miss Bieber are especially rich and varied. Included are such characteristic pieces as belt pockets and purses for carrying small personal objects; cases for calling cards, fans, pipes, spectacles, archers' thumb rings, needles and combs; and portable knife-chopstick sets and strike-a-light kits. These objects now are rare not only in Europe and the United States, but also in China itself.

The miscellaneous textiles encompass a variety of utilitarian materials, especially household objects. The latter include bed covers and hangings, chair covers, a pair of fine and very rare elbow-pillows, mirror covers and various curtains and hangings. Also among these miscellaneous textiles are a charming group of stuffed toys and an excellent collection of old sutra covers of many materials, techniques and motifs, used to cover Buddhist religious books.

Paper cut-out of Lion Dog, used as pattern for embroidered pillow-end

Silver snuff-bottle with Lion Dog motif, top inset with turquoise and coral

1

2

3

1-Bracelet of bamboo with silver fittings

2-Toggle: Gourd fitted with carved bone hand

3-Compass in carved wooden case

Other substances: The General Collection comprises also an immense range of minor-art and utilitarian objects made of ceramics and glass, ivory and bone, leather, metal, paper, rocks and minerals (including jade), and wood, lacquer and basketry. The paper objects are particularly rich in number and variety. Among these is a delightful group

(*Continued on page 7*)

CHICAGO NATURAL HISTORY MUSEUM *News*

Expeditions

Dr. Paul S. Martin, Chief Curator of Anthropology, departed April 30 for Arizona to continue his long-term project of archaeological excavation and study in the Southwest, which has brought to light the history of vanished Indian tribes that formerly inhabited that section of the United States. He is being assisted this year by James Hill and John Fritz, graduate students at the University of Chicago, and six other college students.

Site of this year's "dig" again is Vernon, Arizona, where Dr. Martin is excavating the remains of at least 100 rooms and a plaza, representing the last location occupied by Indians who abandoned the region about A.D. 1300–1400. It is expected that the archaeological work will continue through September.

More than four hundred pounds of botanical specimens, representing some 13,000 plant specimens—the fruits of four months of botanical collecting in Central America by Dr. Louis O. Williams, Curator of Central American Botany—arrived at the Museum last month.

And there are more plants to come!

Although Dr. Williams is now back at the Museum, plants will continue to arrive for two more years, for the Museum's work in Central America is being continued by Sr. Antonio Molina R., botanist of the Escuela Agricola Panamericana in Honduras, and by Sr. Alfonso Jiménez M., head of the biological section of the Museo Nacional de Costa Rica at San José. Their collecting will concentrate on Honduras, El Salvador, Nicaragua, and Costa Rica and is supported by a National Science Foundation grant awarded Dr. Williams for continuation of the Museum's long-term studies of the flora of Central America.

Not only plants, but also honors, were gathered by Dr. Williams during his recent study trip. For his outstanding botanical work in Central America Dr. Williams was named "Investigador Botanico" of the Museo Nacional de Costa Rica.

Staff Notes

Mrs. Christine S. Danziger has been appointed Anthropology Conservator, a new staff position carrying responsibility for the preservation and restoration of anthropological specimens, especially those made of metal.

Of serious concern to all museums is the chemical decomposition of valuable bronze, iron, and silver objects in their research collections. Over a period of many years, or centuries, the chemical composition of some metals becomes unstable, due to the presence of salts they absorbed from the soil during their long burial in the earth. Through exposure to air and moisture, chemical processes are activated and corrosion begins. Mrs. Danziger will devote her efforts to arresting these processes by scientific methods, and to saving objects already partially damaged.

To this task, Mrs. Danziger brings an extensive background in chemistry. For seven years before coming to the Museum her work as a laboratory technician at the University of Chicago was directed toward basic research in organic chemistry.

One of Mrs. Danziger's first responsibilities at the Museum will be to design a laboratory which will be equipped with the specialized apparatus needed for her work of conserving the Museum's collections.

Mrs. Helen A. MacMinn, Associate Editor of Miscellaneous Publications, retired on April 30, 1963. Mrs. MacMinn joined the staff in 1945 as Assistant, Scientific Publications, and in 1947 became Associate Editor of Miscellaneous Publications.

She contributed substantially to the publication program of the Museum, particularly in the design and editing of popular publications. In 1959, "A King's Day: A Day in the Life of an African King," one of the books designed by Mrs. MacMinn, received a certificate of award from the Chicago Book Clinic in its 8th Annual Exhibition for high standards of design, printing, binding, publishing intention, and reader appeal.

Her contribution to the Museum in terms of loyal and effective service cannot be measured, and all of her many friends on the staff wish her happiness in the years ahead.

Dr. John B. Rinaldo, Associate Curator of Archaeology, resigned last month to accept a position with the Amerind Foundation in Dragoon, Arizona. In joining the staff of the Foundation, which promotes and supports archaeological research on the American Indian, Dr. Rinaldo will continue his major archaeological interest in the Indians of the Southwest.

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Dr. Rinaldo, whose association with Chicago Natural History Museum dates back to 1938, first came to this institution as a volunteer after participating in a Museum expedition to Colorado, led by Dr. Paul S. Martin. He very shortly was named an Associate in Southwestern Archaeology, and from that appointment moved on to Assistant Curator and, finally, Associate Curator of Archaeology. He has accompanied Dr. Martin on archaeological expeditions to the Southwest every year since 1946.

Dr. Rupert L. Wenzel, Curator of Insects, has been appointed a Visiting Professor in the Department of Biology at Northwestern University for the summer of 1963. He will teach general entomology, as well as research courses for students working toward advanced degrees.

At Purdue University on May 7 Dr. Wenzel will be the principal speaker at the annual banquet of the Department of Entomology. He was also a participant in the North Central branch meetings of the Entomological Society of America held recently at Purdue, where he represented the Museum with Henry S. Dybas, Associate Curator of Insects. Dr. Wenzel opened the symposium, "Insects as Indicators of Palaeoecology," with a talk on "The Biogeography of the Holarctic Region."

In Memoriam

Mr. Elmer S. Riggs, former Museum Curator of Paleontology and a member of the scientific staff from 1898 until his retirement in 1942, died March 25 in Lawrence, Kansas, at the age of 94.

Except for a year as Museum Assistant at the University of Kansas, from which he was graduated, Mr. Riggs spent his entire working career at Chicago Natural History Museum, coming here shortly after the completion of postgraduate studies at Princeton University. He conducted twelve Museum expeditions in the western United States, two in Canada, and two in Argentina and Bolivia—spending a full four years in South America.

Mr. Riggs and the men who worked under his supervision on these expeditions were responsible for collecting a major portion of the Museum's paleontological material. During the course of his work, the noted paleontologist discovered numerous genera and species previously unknown, and his publications upon these are notable in the literature of his science.

On Exhibit

"Space Geology," the Museum's newest exhibit, prepared specially for the observance of Chicago and Midwest Space Month (April 9 to May 9) will remain on display in Stanley Field Hall throughout the summer months, so that our many summer visitors may have an opportunity to enjoy it.

The theory that life may exist on Mars is illustrated in a new botany exhibit added recently to the above group of special displays for Chicago and Midwest Space Month. It is located on the second floor (east wing) between Halls 25 and 26, and will also remain on display into the summer months.

The exhibit shows what happens to mosses when subjected over a two-months' period to Martian environmental conditions. What those environmental conditions may be is also demonstrated in the display: namely, an atmosphere with little oxygen, but high in carbon dioxide and nitrogen—and no water vapor; temperature extremes approximating those that occur on the earth's deserts, but much lower—varying from far below zero to a little above freezing.

The exhibit was prepared by the Museum's Department of Botany under the direction of Dr. Patricio Ponce de Leon, Assistant Curator of Cryptogamic Botany. Recent experiments conducted by the Armour Research Foundation provided background information for the display.

Prize-winning cut gems, distinctive jewelry of polished stone, and polished stone slabs of unusual beauty will be displayed in the Museum June 8 through July 7 in the 13th Annual Amateur Handcrafted Gem and Jewelry Competitive Exhibition. Sponsored by the Chicago Lapidary Club, the exhibit features approximately 100 displays—all prize-winners in a city-wide competition—which demonstrate how common earth materials, in the hands of a craftsman, can be transformed into objects of remarkable beauty.

This painting is by a young student in the Junior School of the Art Institute of Chicago. With other works by these imaginative youngsters, it will be shown in the Museum through May. The art is inspired by Museum exhibits and includes fabric designs, paper transparencies and cut-out masks, as well as paintings.

Longer Museum hours of 9 A.M. to 6 P.M. every day of the week became effective on May 1.

In the New Zealand bush, Barbara Solem collects a large carnivorous land snail, "Paryphanta"

ALAN SOLEM
Curator, Lower Invertebrates

Pacific Snail Trail

The conclusion of the report, begun in last month's BULLETIN, of Dr. Solem's recent round-the-world study trip, on which he was accompanied by his wife, Barbara. Part I covered his work in Hawaii, Tahiti, Fiji, and New Caledonia.

From French cooking and the casually unorganized life of New Caledonia to New Zealand, with its boiled brussel sprouts and minutely organized welfare state, is only a few hundred miles in distance but a fantastic difference in living. At first, New Zealand seems like a cleaner, tidier section of the Middle West, but the closed stores on Saturday and detailed regulations for commercial enterprises such as restaurants, were surprising to us.

Both Auckland and Wellington had magnificent collections of New Zealand snails. After a quick look at these it was obvious that, while a few groups were closely related to the Polynesian–Micronesian species, most were obviously distinct.

The by now familiar routine of measing, counting, map-making, and typing continued, greatly aided by the night-owl habits of the Auckland Curator. Special permission was received for us to work late hours in Wellington. Week-ends saw us collecting in various parts of the North Island, seeking the carnivorous *Paryphanta* snail, and learning that fallen palm fronds make excellent toboggans for sliding down hillsides. Usually the patches of native forest were surrounded by belts of gorse, a prickly shrub introduced from England to form hedge rows, but now a great pest. In our three week-ends of collecting we managed to get specimens of about two thirds of the New Zealand genera for dissection and, moreover, gained a real appreciation of New Zealand friendliness and hospitality.

Most of the next month was spent working at the Australian Museum in Sydney. A quick trip to Melbourne, Adelaide, Hobart and Launceston enabled us to cover other important collections. It was in Australia that our field trips were enlivened by our only real adventurous mishap. A land leech attached itself to my eyeball and had to be pulled off with collecting tweezers.

By this time we needed a change from the routine of microscope and typewriter, and it was with a sense of relief that we shipped them on to Germany before leaving for Malaya. We had now begun to grasp the broad pattern of endodontid relationships, had accumulated material for dissection from all important areas of the Pacific, and were deeply involved in a side study of the various origins of apertural teeth in the endodontids. As a by-product of our main study we have the basic outline for a reclassification of the Australian endodontids, a subject we had no idea would arise during our visits.

In Malaya we squeezed a collecting trip between brief visits to museums in Singapore and Calcutta. I was inter-

ested in gaining familiarity with the fauna of the limestone hills of Central Malaya. Minute mollusks living on these hills under conditions that isolate the species from each other show the same variations that are found in certain snails of Arizona and Mexico. This was a chance to take a quick look at the area so that we could effectively plan an extensive field trip there in a few years.

A. J. Berry, a zoologist at the University of Malaya, has been working on the life histories of the Malayan snails and was able to accompany us to several localities. On one hill Barbara gained honors by becoming the first person to collect live specimens of a rare genus of carnivorous snails, while the two malacologists, out of their greater knowledge of snail psychology, were overlooking its habitat niche. Evenings we could watch the fabulous patterns of Chinese, Malayan and Indian life in the villages and appreciate the tremendous efforts being made to form a unified nation from these radically diverse cultural elements.

At last, late in May, we started on our final phase of the study trip—a search for endodontid snails in the museums of Western Europe. The endodontids are very small, less than ¼-inch in size, and many had been described before good microscopes were available. From the original measurements and descriptions it was impossible for us to be sure exactly which species earlier workers had before them. Before we could finish our study, we had to locate some of the original material used by each author, compare it against more recently collected shells, and—using the vastly improved microscope available today—redescribe the shells. Extensive search of the literature before we left Chicago and numerous inquiries to museum curators had suggested that endodontids of immediate importance to our study were scattered in twenty-three cities in western Europe.

Chicago Natural History Museum has been accumulating mollusks only since 1938; many European museums have collections dating back more than 200 years. We not only had to know that a certain species might be in a particular museum, but we had to find it after we arrived. Fires—both from natural disasters and wars—changes in buildings, the inevitable disarray caused by neglect when no scientist is actively taking care of a collection—all contribute to making it difficult to locate a particular species in a collection—to say nothing of the effects of dust accumulating for 100 years or so!

A major logistic problem was to time our visits to avoid local holidays and vacation schedules, a venture in which we succeeded everywhere except in Sweden. By chance, the malacologist at Göteborg came to Chicago after I had already left on the study trip, and was then on vacation when I visited Göteborg. Despite all difficulties and the destruction of several collections during World Wars I and II, we managed to locate over 90 per cent of the material we had hoped to find, and now have detailed descriptions of nearly all the known species of endodontids from the Pacific Islands.

Filled with wonderful memories of our travels, and laden with manuscript, notes, and some specimens, we returned to an office stuffed with a year's accumulation of mail, box after box of loaned material and field collections we had shipped ahead, plus all the assorted problems we had hastily stuffed into drawers just before leaving. No miracle had happened, they were still waiting to be described or discarded, and the letters still required answers. Little by little this work progresses and soon I can turn to the endodontids again. In time, the growing stack of manuscript will be ready for publication and eventually, when asked, "What did you do during the year of traveling?" I can bring out a stack of technical publications and reply, "This!"

At the same time: "If I had some more material from Tonga and Samoa, maybe we could clear up this problem . . . I'm not satisfied with the relationship of these Australian species. . . Why do the Fijian species have such strong apertural dentition . . . " and a thousand other questions occur, all needing more field work, additional specimens, more study, another trip. Such is the path of research—with always another question to ask, another problem to investigate, and long hours of routine labor ahead. Yet the thrill of seeing a possible solution, the satisfaction of a completed job, the unforgettable sights and experiences along the way, lead you on, and on, and on.

COLLECTING WITH A PURPOSE

(*Continued from page 3*)

of knife and scissor cut-outs representing culturally meaningful subjects. These were used either as embroidery patterns or as decorative pieces for windows or lanterns. There also are very rare stencils for preparing resist-dyed textiles, paper charms, and decorative appliques. Finally, there is an extensive group of shadow-puppet figures, some of leather, but many of paper.

Jewelry: Another subgroup consists of jewelry and includes rings and bracelets, beads and buttons, hair ornaments, amulets, pendants, and rare rosaries with beads made of fragrant incense paste covered with gilt or with tiny bits of brilliant blue kingfisher feathers.

Non-Chinese materials: Finally, the General Collection also contains a small but select group of folk materials from Asian areas other than China. Represented are Japan, Korea, Mongolia, Central Asia and Tibet, Indo-China, Borneo, India and Persia.

As was noted above, Miss Bieber assembled this General Collection under the guiding principle of showing the immense range of materials, techniques, and decorative motifs, especially symbolic ones, represented in Chinese folk arts. With this goal in mind Miss Bieber also systematically garnered a valuable body of associated data relating to virtually every piece in her collection. These data include such information as when and where the piece was obtained, and often from whom, and information about the substance and techniques involved in the manufacture of the object, the symbolism represented in its motifs and, finally, its use. Frequently these facts are supplemented by photographs showing the techniques by which a given piece was made and/or the use to which

(*Continued on next page*)

(*Continued from preceding page*)

it was put. Thus, it may be seen that the systematic manner in which Miss Bieber assembled her collection makes it especially valuable and useful for scholarly and museum needs.

TOGGLE COLLECTION

Toggles, akin to Japanese *netsuke* and ancestral to them, are beautifully fashioned small objects traditionally used by the Chinese as decorative counterweights for the various costume and personal accessories worn suspended from the belt. Generally two to three inches in greatest dimension, but with their size dependent upon their shape and weight, toggles were fashioned from a wide variety of materials in a great diversity of form and with an endless range of decoration, this last almost always drawing its inspiration from the marvelously rich body of Chinese folklore. The Bieber collection of toggles,[1] examples of which were featured on the cover of the *Bulletin* for December, 1962, is unmatched in quality, size and variety, and now is on display in its entirety in the new Chinese gallery currently being installed on the west balcony overlooking Stanley Field Hall.

LION DOG COLLECTION

The Lion Dog Collection, again unique as a collection, was formed by Miss Bieber to show the great diversity of manner in which a single Chinese folk motif, of which there are almost an endless number, may find expression. The Lion Dog is a fascinating zoological, historical and cultural phenomenon and is one with which Miss Bieber is particularly well acquainted. Zoologically, the Lion Dog, or *shih-tzu kou*, is to be differentiated from both the Lhasa apso, indigenous to Tibet and recognized as one of the oldest breeds of dogs, and the Pekinese, a quite new breed. During her ten years of residence in Peking, as well as in more recent years in Santa Fe, Miss Bieber maintained an active interest in the intelligent and plucky *shih-tzu kou*, keeping a number of them herself.

Historically and culturally the *shih-tzu kou* is even more intriguing. As a real animal the lion never occurred in China, and the ideas that the Chinese had of the lion came either from hearsay and legend or from occasional contact with specimens sent to the Chinese court as tribute or as gift. The ultimate source of Chinese ideas about the lion seems to have been in the Middle East, especially Persia, where the lion was a symbol of both divine and secular power. These ideas seem then to have moved from the Middle East into India, presumably with the movement of Persian cultural elements into that country in early times, and then from India into Tibet. From these countries ideas about the lion spread into China and other areas eastward, as Korea and Japan. Somewhere along the line of diffusion of these ideas through time and space the lion became identified with the little lion-like dog which in Tibet as well as in China and other Asian countries came to be associated, first, with Buddhism, as had been also the lion, and, second, with popular religion and folklore. In each context the Lion Dog became a symbol of courage and, by extension, protection, and it is in terms of these qualities that the Lion Dog motif appears on an infinite variety of objects.

Those intrigued by the Lion Dog will be pleased to know that Miss Bieber will give an illustrated talk on the Lion Dog, its history in fact and fancy, and its part in Chinese life and lore. The talk, for which there will be no charge, is scheduled for the second floor meeting room of the Museum on Thursday, May 16, at 3:30 in the afternoon.

THE Museum's collection of utilitarian and minor-art materials from the Ch'ing period long has been recognized as one of the largest and most comprehensive in the world. The addition of the Bieber Collection, which came to the Museum largely through the great generosity of Miss Bieber, assures this fact.

Cover: Tiger-collar for child's costume—inset, detail from pillow end, petit-point on gauze

(Cover designed by Theodore Halkin)

Below: Brass beard comb and associated lucky pieces

[1]These 230 toggles have been described and illustrated in a recently published book written by Dr. Schuyler Cammann, of the University of Pennsylvania, entitled *Substance and Symbol in Chinese Toggles—Chinese Belt Toggles from the C. F. Bieber Collection*. Published by the University of Pennsylvania Press (1962) the book is obtainable in the Museum Book Shop for $15.00.

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Bulletin

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TRASH + COMPUTER = ARCHA

Pottery design elements used in computer study described in article

PAUL S. MARTIN
Chief Curator, Anthropology

IN THE course of a single season of excavations in an ancient village or trash mound in Arizona, members of the Museum's Southwest Archaeological Expedition dig up thousands of objects that were once part of the daily lives of the prehistoric villagers.

What do we do with this miscellaneous debris? We use it for obtaining information about the extinct culture of the peoples who inhabited the village. Writing was unknown to these people; we interpret their history from the trash that they discarded and the way it was deposited, and from the houses that they left behind.

In our own culture we have certain fixed habits relating to what we do, how we think, what we believe, what we keep and treasure, what we throw away, the kinds of houses and towns in which we live, the churches we build, our burial customs and cemeteries. All these examples and countless others follow a fixed pattern of the "proper" way to do things.

These habits are completely different from those of the Aztecs, the Pueblo Indians, the Hindus, or the Japanese, for example.

Hence, archaeologists believe that they can discover something about the lives of ancient peoples by studying what they abandoned. The disposition of discarded items in the deserted town follows a fixed pattern. The behavior of a people, then, is entombed in what they left behind when a town or area was abandoned.

Now to answer explicitly the questions of what we do with the archaeological data, or objects, after we dig them up; and how we recapture cultural behavior from the disposition of abandoned, lost, or discarded objects and the arrangement of houses.

The trick is to recapture *that* behavior from *this* debris by collecting random samples, analyzing them, and then subjecting the data to arithmetical tests by means of a computer. This electronic brain does for us all the elaborate calculations that we could not undertake in the past because of the great amount of time and labor that would have been involved.

Using results obtained from the computer, we can make interpretations that will explain the uses both of the archaeological debris and of the rooms or groups of rooms once inhabited by ancient peoples.

THE analysis by computer of materials collected by the Southwestern Archaeological Expedition was the idea of two cooperating graduate students at the University of Chicago, Leslie Freeman and James Brown. They were stimulated and advised by Professor Lewis R. Binford, also of the Department of Anthropology at the University of Chicago.

Approximately 1,000 different calculations were run on data obtained from the Carter Ranch site. One problem required only two minutes for the computer to calculate, whereas if done without the aid of the Univac the operation would have taken over 18 man hours of time. All of the calculations if done "by hand" would have required about 1,000 man hours, or 125 days of 8 hours each. The result is that we would not have undertaken these complex analyses and operations without a digital computer.

Here are a few of the results that pertain to the pueblo excavated on the Carter Ranch:

1. We were able to recognize types of pottery.

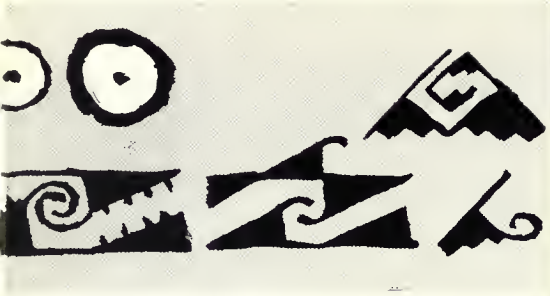
2. Four groups of several different pottery types were found. One of these consisted only of pottery bowls; the others of bowls, jars, and pitchers. We think that each of these groups was used for different purposes, as are pots and pans versus dishes and glasses in our culture.

3. It was demonstrated that four house types were used for special purposes. It seems proper to suggest that different activities took place in each type of house and/or that a lineage segment (a group of people having a common ancestor) occupied several adjoining rooms. One rectangular room, the use of which was unknown, was shown to be a ceremonial chamber.

4. Bowls with shiny black interiors may have been used as mortuary or ceremonial pottery.

5. One kind of pottery—indented-

EOLOGY



corrugated jars—was kept on the roofs of houses for some special purpose.

6. Two varieties of Snowflake Black-on-White pottery bowls were noted. The bowls bore similar designs and were used for the same purpose, but when one variety was used for that purpose in a specific room, the other was not.

7. Most of the pottery from one trench was unpainted. The reason for this is not known.

8. No significant chronological differences within the village were isolated from the data at hand. We assume that the village was occupied but once and for a relatively short time—perhaps 50 to 100 years in all.

9. According to our computer records these statements are 99.7 per cent correct.

An important lesson I have learned from this work is that the archaeologist must plan his digging job with more care. Gone are the days of haphazard trenches and the digging of rooms by guesswork. Unless one plans to dig an entire site, all excavations must adhere to rigid and appropriate sampling methods. If the excavations are conducted in this manner the recovered data can be used in tests amenable to computer processing. It would be a waste of human effort and machine time to try to process data obtained by haphazard sampling.

SOME of the same potsherds used in the computer analysis were also used

(*Continued on page 7*)

1

2

1-Walls of rooms on Carter Ranch site were exposed so total number of rooms could be determined and statistically random sample chosen for excavation.

2-Dirt from trench was removed by layers, sifted, and all materials saved.

3-Use of this room was uncertain until computer performed statistical analysis of sherd counts which suggested room had special nonutilitarian purpose, probably ceremonial.

3

CHICAGO NATURAL HISTORY MUSEUM *News*

New Associates Appointed

Four new Research Associates and two Field Associates have been named to the scientific staff of the Museum, it was announced recently by Director E. Leland Webber.

The new Research Associates are: Dr. Marjory Carlson and Dr. Sidney Glassman, botanists; Dr. Philip Dark, anthropologist; and Dr. Bernard Greenberg, zoologist. Field Associates added to the staff are: Ing. Antonio Molina R. and Ing. Alfonso Jiménez M., also botanists.

Dr. Marjory Carlson, professor of botany at Northwestern University until her retirement, has been a frequent visitor to the Museum for many years. Her contributions during that time have been both in service and in botanical materials—numerous plant specimens collected by Dr. Carlson on her study trips to Mexico, Central America, and Hawaii. The Museum has published her paper on the genus *Russellia*, which was based largely on the Museum's collections, and she is currently making a study of mistletoe-host relationships.

Dr. Sidney Glassman is a professor of biology at the University of Illinois (Navy Pier branch). A number of years ago he became engaged in a research project on the wax palm. This project was initiated by the late Dr. B. E. Dahlgren, Curator Emeritus of Botany, and was supported in part by S. C. Johnson and Son, Inc. The first part of a report on the taxonomy of the wax palm has been published in *Gentes Herbarium* and a concluding part is in press. Dr. Glassman has collected in Guam, the Philippines, the Caroline Islands, Cuba, and in western United States. Currently he is preparing a revised index to American palms and a revision of the palm genus *Syagrus*.

Dr. Philip J. C. Dark, professor of anthropology at Southern Illinois University, was an invaluable aid to the Museum last fall when he acted as consultant in the planning of the Museum's major

(*Continued on page 5*)

ANTARCTIC EXHIBITION CO

"I am hopeful that Antarctica, in its symbolic robe of white, will shine forth as a continent of peace, as nations working together there in the cause of science set an example of international cooperation."
Rear Admiral Richard E. Byrd, U.S.N.

"Antarctica—The White Continent," a new exhibition opening at the Museum on June 26, pays tribute to man's exploratory and scientific accomplishments on the world's least-known continent.

Through photographic enlargements in color and black-and-white; on-the-spot paintings by California artist, Arthur Beaumont; models and reproductions of life under survival conditions; and demonstrations of the tools of scientific investigation; the exhibition tells the story of the current all-out assault being made on the frozen continent surrounding the South Pole.

Highlighting the 3,000-square-foot exhibition are displays especially prepared by the National Science Foundation, the U. S. Geological Survey, the U. S. Navy, and the U. S. Weather Bureau showing the current status of their work in Antarctica. These exhibits demonstrate the use of exploration and survival gear, as well as meteorological, geological, and electronic recording equipment, and show how man lives in the frozen desert, what progress he has made in exploring, mapping, and charting the continent, and the results of his studies of Antarctic animal life from prehistoric times to the present.

"Antarctica—The White Continent," is the outgrowth of a recent visit by Museum Director E. Leland Webber to the first international Antarctic exhibition at The Mariners Museum in Newport News, Virginia. At the close of its successful six-months' showing there, Mr. Webber arranged to bring the major portion of the exhibition to the Midwest. The exhibition will remain on view through September 2.

Chicago Natural History Museum
Founded by Marshall Field, 1893
Roosevelt Road and Lake Shore Drive, Chicago 5
Telephone: WAbash 2-9410

NG JUNE 26

Above: *An important part of the exhibition on "Antarctica—The White Continent" is a display prepared by the National Science Foundation illustrating its scientific accomplishments in Antarctica since the beginning of the International Geophysical Year in July, 1957. Housed in its own 20-foot structure, this exhibit contains large illuminated transparencies demonstrating the biological studies which the N.S.F. is making of Antarctic fossils and sea life. Operation of a push button illuminates other panels showing the progress of research on seismic soundings, on the lines of force in the earth's magnetic field, and on the Antarctic ice cap. The photograph shows a portion of the N.S.F. exhibit being viewed by a visitor to The Mariners Museum in Newport News, Virginia.*

Left: *Basic to the exhibition is a comprehensive record of man's accomplishments on the frozen continent made by the noted Swiss photographer, Emile Schulthess. This outstanding collection of color and black-and-white photographs has been loaned through the courtesy of the United States Information Agency. (Photograph taken in The Mariners Museum)*

(*Continued from page 4*)

exhibition on "The Art of Benin." He also prepared the catalog for the exhibition. Dr. Dark's knowledge of Benin springs from his participation, during 1957–1960, in the Benin History Scheme, sponsored by the Nigerian and British governments and the Carnegie Corporation. Purpose of the scheme was to investigate the history, social anthropology, and the art of the kingdom of Benin. Dr. Dark's own research on this project resulted in his co-authorship of *Benin Art*, published in 1960.

Dr. Bernard S. Greenberg, professor of biology at Roosevelt University, last year accompanied Dr. Robert F. Inger, Museum Curator of Reptiles and Amphibians, on a three-months' study trip to Borneo. The trip was made possible by a $35,000 grant from the National Science Foundation for research on the "Reproductive Patterns and Population Structure of Borneo Amphibians." Their work in the field is now being continued by Mr. F. Wayne King while Dr. Inger and Dr. Greenberg carry out detailed laboratory studies of the specimens collected.

New Field Associates Ing. Antonio Molina R., curator of the herbarium and botanist of the Escuela Agricola Panamericana in Honduras, and Ing. Alfonso Jiménez M., head of the botanical section of the Museo Nacional, San José, Costa Rica, are now collecting plants in Central America for the Museum in collaboration with Dr. Louis O. Williams, Curator of Central American Botany. Their collecting is part of a project for botanical field work in Central America that is being assisted by a National Science Foundation grant.

Summer Hours

With the opening on Wednesday, June 26, of the 1963 season of free Grant Park Concerts, held in the outdoor bandshell just across the drive from the Museum, Chicago Natural History Museum will extend its hours from 9 A.M. until 8 P.M. on concert evenings—Wednesday, Friday, Saturday, and Sunday. On these days the cafeteria will serve dinner until 7 o'clock. On Monday, Tuesday, and Thursday the Museum closes at 6 P.M.

Summer Journey

"Journey Through the Insect World," the new Museum Journey planned by the Raymond Foundation for the summer months, begins on June 1. Especially designed for youngsters, this self-guided tour takes advantage of a group of new exhibits illustrating the diverse forms and life habits of the major groups of insects. (Regular readers of the BULLETIN will recall the description of the exhibits given in the March issue.)

An instruction sheet for the tour, which contains questions about the exhibits to be filled out by youthful journeyers, is available at the north and south entrances to the Museum and at the information desk. Completed questionnaires should be turned in at barrels provided near each entrance, so that journeyers may receive credit points leading to Journey awards.

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Members are requested to inform the Museum promptly of changes of address.

Memory Magic

FRITZ HAAS
Curator Emeritus, Lower Invertebrates

M. Pahl

DR. Fritz Haas, our Curator Emeritus of Lower Invertebrates, has been active for more than fifty years in his branch of science, the study of non-marine mollusks. From his early days as a student in Germany through his years as curator of mollusks at the Senckenbergisches Naturforschende Gesellschaft in Frankfurt-am-Main, and during his association with Chicago Natural History Museum, he has been interested especially in the fresh-water unionid clams. Now, at the age of 77, he is busy preparing a world monograph of the group for *Das Tierreich*, a project that will occupy his time for the next few years.

Some months ago, the Museum acquired a collection of non-marine mollusks from a private collector in Seattle. In the course of processing these new materials into the Museum's collection, Dr. Haas was amazed to discover some old friends—fresh-water clams that he had personally collected in Europe forty to fifty-five years ago! How these clams found their way from Europe to Seattle, and finally to Chicago Natural History Museum is a long and involved story. What we would like to share with our Museum Members, many of whom are, themselves, collectors of long-standing, are some of Dr. Haas' memories associated with these specimens. [**Ed. note**]

Unio crassus batavus
(MATON & RACKETT)

Wickerbach near Florsheim, Germany
July, 1912

At this time I had just become interested in fresh-water clams, and was systematically combing the rivers, streams, and ponds near my home town for the mussels. Being inexperienced, I equipped myself with bulky hip boots for wading in the water. Only later did I learn that the bare foot gives you much surer footing, besides allowing you to feel for the buried clam in the bottom muck. On that day in July I was working a mill creek in water almost up to my hips, when it began to rain—at first slowly, then much harder. Soon I was completely soaked except for the only parts of me actually under water, my legs and feet, which remained safely dry in the hip boots.

Unio crassus cytherea
(KUSTER)

Wornitz River near Mosbach, Germany
July, 1912

In those days, as probably now also, Southern Bavarians looked upon North Germans ("Prussians") with great dislike or even fear. They were no more welcome in the country districts than a revenue agent in the North Carolina mountains.

I was used to having to explain my very odd actions—wading and fumbling in all sorts of waters—to curious passers-by, but on this day an old peasant woman was particularly curious. Indeed, her questions were so many and frequent that I was seriously distracted from my work. Finally, I told her sternly that I was a Prussian, whereupon she crossed herself and ran away!

Psilunio littoralis littoralis
(LAMARCK)

Ebro River near Sastago, Spain
September, 1915

When World War I broke out, I had recently arrived in Spain for a short field

trip, which lasted for years because I was stranded by the war. Luckily I was able to make extensive studies of Spanish non-marine mollusks. On this trip to the Ebro River near Zaragoza, I was after a big mussel which I had known previously only from fossil stages in the Rhine sands. In the deeper pools of the Ebro these clams were abundant, and I soon obtained a good series. Then, to my intense joy, I discovered an assemblage of very young shells of this species in shallow water less than ten inches deep. In my enthusiasm, I simply plopped down on my belly and started to collect, ignoring the exposure of my back to the hot Spanish sun. Later on my back began to hurt, and that night the pain became so bad, I had to dress and walk a half mile to a doctor's house (there was no telephone). He, in turn, wakened the pharmacist, and through their ministrations I survived, but with the afternoon's collecting "burned" into my memory.

Unio elongatulus valentinus
(ROSSMAESSLER)
Dehesa, Albufera de Valencia, Spain.
July, 1917

The Albufera de Valencia is a big fresh-water lagoon south of the city of Valencia. For several days previously I had engaged an old fisherman to take me from one portion of the lake to the other. He had become quite accustomed to seeing me wading in the shallow water near the shore, where mussels were quite plentiful. On this occasion, I spotted some in water too deep for hand collecting or even the dip net. So I stripped myself and dove for the mussels. Never did I expect such an outburst from my fisherman! He implored me to come out, since he could not swim, and how could he help me if an accident happened!

THESE and many more cherished memories have come flooding back in past weeks, conjured up by good acquaintances, those fresh-water clams plucked from the waters of Europe so many years ago. Who could have believed that these old greenish-brown clam shells could work such magic?

TRASH + COMPUTER = ARCHAEOLOGY

(*Continued from page 3*)

statistically in another study, this one being accomplished by William A. Longacre, graduate student in anthropology at the University of Chicago. Since his study involved the use of the *designs* painted on the sherds, he found it necessary to reject about 28,000 sherds and to use only about 6000 sherds that clearly displayed designs or elements of designs.

Omitting all details as to the mechanics of this study, I may briefly outline some of the results.

Within the site under study a two-fold pattern emerged: (a) roughly 60 per cent of the design elements show a pan-village distribution without any clustering or preferential grouping; (b) the other 40 per cent of the design elements did cluster, some at one end and some at the other end of the village trash heap. Mr. Longacre's interpretation of this (along with other evidence) is that the site had been occupied by at least two matrilineal groups who practiced matrilocal residence patterns (in this marriage custom, the husband resides with the wife's family). This inference would suggest that two kin-based groups of potters occupied the pueblo; that each one favored certain design elements and rejected others; but that each group also used some designs in common with potters from the other end of the pueblo. Certain design elements, then, may constitute a kind of "hall mark" for a given lineage. These differences in groupings of design elements within the village were *not due* to any chronological differences in the trash.

Several other hypotheses were derived from Mr. Longacre's study. One of the most interesting of these is that each village seems to have had separate but related ceramic traditions and that villages of a given valley also share certain design elements. Thus one can speak of three subdivisions of a particular pottery type: 1) kin-based, intra-mural traditions of pottery decoration; 2) a village tradition of pottery decoration; and 3) a regional tradition, or style, composed of traditions of pottery decoration from several villages within the same valley.

THUS, the use of statistics—a notion that used to make me shudder—has changed my concept of archaeology. The study of extinct cultures can now go far beyond description. We can now ask new questions about the life of prehistoric peoples—questions that were never before possible. Years ago, for example, we used to think that archaeology could not recover data on the social organization of an extinct people. We now know it can. These sorts of questions are the real "stuff" of archaeology for me; I think we are on the threshhold of an exciting breakthrough in the study of prehistory.

Flower Portraits

"Flower Portraits," an exhibition of 69 water color paintings of favorite North American and European flowers, will be displayed from June 15 through July 31 at the entrance to the Museum's new Hall of Useful Plants (Hall 28, Second Floor—East). The large-size paintings were made by Miss Ethelynde Smith of Altadena, California.

Is it real?

Skins of every large mammal in the world are available for study on these storage racks.

A RECORD MEMBERS' NIGHT!

On the evening of April 26, 1,905 Museum Members—a record number—enjoyed a once-a-year opportunity to visit behind-the-scenes areas devoted to exhibit preparation, laboratories, and storage of collections, and to gain a better understanding of the research being done by Museum scholars and scientists.

PLANT . . .

. . . OR ANIMAL? Twin microscopes reveal a biological dilemma.

Authentic music and textiles evoke life in Old China.

Taxidermy workshop: These hides are mounted—never "stuffed!"

Members' Night photographs on this page and the cover by Marilyn K. Jindrich.

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CHICAGO NATURAL HISTORY MUSEUM

Bulletin

Vol. 34 No. 7
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COR

A view of Moorea

TAHITI, the proverbial island paradise of the South Seas, has for centuries, like a lodestone, attracted men to its shores. It has been said that for every person who travels to Tahiti the island holds a different promise. Captain Bligh set his course for Tahiti to obtain breadfruit, a hoped-for answer to England's agricultural problems. Captain Cook once visited the island because it was a good vantage point from which to observe the transit of Venus across the disk of the sun. Gauguin, of course, found artistic inspiration there.

Recently a well-known Chicago businessman and world traveler, A. Rush Watkins, also responded to Tahiti's call. What was it that lured him to the island?

Fish! . . . Not to eat, or to mount as a trophy above a fireplace, but fish for the research collections of Chicago Natural History Museum.

Tahiti's Polynesian inhabitants have always relied on fish as the most important staple of their diet. Yet only one half of Tahiti's approximately 600 species of fishes are well known to scientists. The first really intensive studies made of marine fauna of the Pacific were begun in 1946 and 1947, when the United States conducted its series of atomic tests off the island of Bikini. At that time scientists were concerned about the effect of the bomb on marine life.

For some years Chicago Natural History Museum had been aware of a number of gaps in its scientific records and collections from this area of the Pacific. However, an opportunity to obtain the needed data and specimens had never presented itself until Mr. A. Rush Watkins walked into the Museum late in 1961 to announce that he was contemplating a trip to Tahiti and wondered if the Museum would be interested in any of its animal life. Watkins had already contributed handsomely to the research collections of the Museum through sponsorship of and participation in three other expeditions: to Mexico in 1947–48 to collect small coastal fishes; to Thailand in 1949 to collect mammals, birds, reptiles, insects, and some botanical specimens with Colin Sanborn, then Curator of Mammals; and to Arkansas to obtain swamp rabbits and raccoons.

Loren Woods, Museum Curator of Fishes, sat down with Watkins, described the Museum's interest in the fishes of Tahiti—and it was settled. Watkins would go to the island to collect specimens for Chicago Natural History Museum, and would provide whatever financial backing was needed for the venture.

WHAT the Museum wanted were fishes from depths below 35 feet. Watkins had only collected in shallow water, using hand nets. The Tahitian expedition called for deep coral reef diving. So the first step was to enroll in a SCUBA diving class in a Chicago YMCA. There Watkins trained for two months. Later he traveled to the University of Miami's School of Marine Biology to learn how to collect fish by using a poisoning agent.

With these exacting training lessons out of the way, it was full sail for Tahiti.

WATKINS arrived on the island in January of 1962, in the midst of the annual rainy season, when it is not unusual for as much as 40 to 45 inches of rain to fall during a single week. This complicated his early work considerably for after a strong rain the lagoons become murky and the danger of attacks by sharks is heightened. On the other side of the ledger, however, he found ideal water temperatures of 80 plus degrees and air temperatures generally around 90 degrees.

The first consideration was to obtain suitable accommodations for sleeping

AL REEF COLLECTING
in Tahiti

MARILYN K. JINDRICH
Associate, Public Relations

A. Rush Watkins relaxes in his bungalow in the District of Papeari

and working. Luckily, Watson was able to find a comfortable bungalow located on the western part of the island in the District of Papeari. Next, there was the problem of hiring assistants for the weeks of collecting ahead. Watkins found the help he needed in Christina Spies and Star Teriitahi. Star, known as Tahiti's best male diver, had the reputation of being able to free dive (without tanks or weights) to depths of 60 feet. Christina's job was to take care of things in the boat while Watkins and Star were diving.

For more than two months Watkins spent almost every day with these two helpers, working in the water six or seven days a week. The result, according to Loren Woods, is "an excellent, representative collection of approximately 1,200 fish specimens well preserved and annotated." Many of the specimens are described by Woods as "very uncommon," especially the smaller varieties—blennies, some unusual types of sea bass, sand divers, squirrel fishes (so named because of their big brown eyes), angel fish, and butterfly fish. A good number of these are new to the Museum's collections.

Before his departure Watkins had been instructed to go after the little fish because they are much less known than the larger varieties. However, he did collect some of the more spectacular large fishes, including the notorious stone fish whose poisonous dorsal spines can cause the death of anyone stepping on them. Another poisonous species "bagged" by Watkins is the lion fish whose high dorsal fin is suggestive of a lion's mane.

THE QUESTION that naturally comes to the mind of anyone who has never done any deep coral reef collecting is: "How does one actually go about it?"

The answer is found in Watkins' own description of a typical day during his stay in Tahiti:

"Morning began for me at about 6 A.M., when a breakfast of French bread, Danish bacon, grapefruit, bananas, papayas, and mangoes was brought to my bungalow by the daughter of my Tahitian landlady. After that delightful start for the day, I faced the chore of preparing the previous day's catch for storage and shipment. By the time this painstaking business was out of the way, Star and Christina usually had arrived on the scene and we all pitched in to load the boat with gasoline and our collecting and diving equipment. Then we were ready to begin cruising the lagoon for a good collecting site. The best time of day to collect is around high noon, when the sun's rays are most nearly vertical and you can see better under water.

"First we investigated the waters around the island, using our snorkels. The most desirable area for diving is a clear sandy or dirt bottom flanked by a natural wall. When we found such a location, we measured the depth, because the waters had to be more than 35 feet for the fish to be of value to the Museum. To do this, I had a lead line as well as a depthometer that I wore on my wrist.

"If the depth was right, I dived down with a plastic container filled with the poisoning agent. Star would watch me from above, and when he noticed I was out of the poison he would free dive down to me with additional containers. We waited in the boat 10 or 15 minutes for the poison to diffuse through the water. Then we went down and scooped

(*Continued on page 5*)

CHICAGO NATURAL HISTORY MUSEUM *News*

Honors

An honorary doctor's degree was awarded D. Dwight Davis, Curator of Vertebrate Anatomy, by his alma mater, North Central College, at the annual commencement exercises of the college held June 9.

Dr. Davis received his Bachelor of Science degree from North Central in 1930, and did graduate work at the University of Chicago. Author of many articles published in technical journals in his field of research, he is also co-author, with K. P. Schmidt, of a popular work, *Field Book of Snakes of the United States and Canada.* His most recent research, a definitive study of the morphology of the giant panda, will be published by the Museum.

Davis has been a member of Museum expeditions to Texas (1937), the Caribbean (1940), North Borneo (1950), and Malaya (1958–59). In 1954, he was visiting professor of paleontology at the California Institute of Technology, and in 1962 was invited to deliver five lectures at a summer institute on comparative anatomy held at Harvard University.

Miss Edith Fleming and Miss Harriet Smith, guide-lecturers in the Museum's Raymond Foundation, have been selected to participate this summer in a training program in anthropology sponsored by the American Association of Musums under a grant by the National Science Foundation.

The six-week program, conducted June 15 to July 25 at the Arizona State Museum in Tucson, offers advanced courses in anthropology to 28 candidates selected from the professional staffs of museums throughout the United States and Canada. The program is a pilot project in a nationwide effort to assist the museum professional in bringing to his community the most recent advances being made in various fields of natural science.

Lectures will cover the archaeology of the Old World and the Far East, as well as African ethnology. Greatest emphasis, however, will be on the Americas, with one week devoted to an intensive study of Southwestern archaeology and ethnology followed by field trips to Hopi and Navajo Indian reservations and to various archaeological sites.

Lecturers for the courses include many of the country's most eminent anthropologists, among them Dr. Donald Collier, Chicago Natural History Museum's Curator of South American Archaeology and Ethnology. Dr. Collier will present four lectures on the development of civilization in Peru and in Meso-America.

Seminars for the exchange of educational techniques developed by individual museums will also be part of the Arizona program.

Both Miss Smith and Miss Fleming bring to these invitational sessions a wide experience in anthropology and museum education. After graduating from the University of Chicago with a master's degree in anthropology, Miss Fleming was appointed a research assistant on the University's Committee on Human Development. She came to Chicago Natural History Museum first as a museology student in the department of anthropology, and later joined the staff of the Raymond Foundation as a guide-lecturer.

Miss Harriet Smith was graduated from Northwestern University and received her master's degree in anthropology from the University of Chicago. Before coming to the Museum she had served as state supervisor of the extension program of the Illinois State Museum, as assistant to the director of the Chicago Academy of Sciences, and as director of nature study films for Coronet Instructional Films.

Dr. Fritz Haas, Curator Emeritus of Lower Invertebrates, was made an Honorary Member of the German Malacological Society at its annual meeting in April. Dr. Haas was born in Germany and for many years was curator of mollusks at the Senckenbergisches Naturforschende Gesellschaft in Frankfurt-am-Main. He came to Chicago Natural History Museum in 1938 as Curator of Lower Invertebrates and remained in that position until 1959 when he achieved emeritus status.

Miss Miriam Wood, Raymond Foundation head, has received a special award in recognition of her work over many years in providing educational and recreational programs for the Girl Scouts of Chicago. The award was presented during the recent Girl Scout Day Program at the Museum.

In addition to this event held once a year in the Museum, other programs for Girl Scouts are provided by the Raymond Foundation, with the cooperation of the scientific staff, which help toward the earning of "Nature Proficiency

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Members are requested to inform the Museum promptly of changes of address.

Badges." Miss Wood has served as Consultant on the Girl Scout Program Committee for several years and has worked with both professional and volunteer Girl Scout leaders in planning programs of value to the girls.

Meetings Attended

In May, Miss Wood and Mr. E. Leland Webber, Director, attended the annual meeting of the American Association of Museums in Seattle. Mr. Webber participated in a panel discussion on "Coordinating Museums with Schools and Colleges," and was elected to the Council of the Association.

Dr. Joseph Curtis Moore, Curator of Mammals, and Mr. Philip Hershkovitz, Research Curator, Mammals, represented the Museum at meetings of the American Society of Mammalogists held during June in Albuquerque, New Mexico. Dr. Moore presented a paper entitled "A Reconsideration of the Beaked Whale Species, *Mesotlodon Stejnegeri* and reported on the work of the Standing Committee on Marine Mammals, of which he is chairman.

Mr. Hershkovitz' contribution to the session was a report on the classification and distribution of New World primates.

Dr. Alan Solem, Curator of Lower Invertebrates, presented two papers, "Pacific Snail Trail" and "Shells and Their Keepers," at the annual meetings of the American Malacological Union held June 18–21 in Buffalo, New York.

"Pacific Snail Trail" is an account of Dr. Solem's recent round-the-world expedition for Pacific endodontid land snails. It first appeared as an article in two parts in the April and May issues of the BULLETIN this year. "Shells and Their Keepers," based also on Dr. Solem's year-long study trip, is a world survey of museum shell collections and their curators.

Dr. Fritz Haas attended the malacological meetings with Dr. Solem.

CORAL REEF COLLECTING *in Tahiti*

(*Continued from page 3*)

up the anesthetized fishes with hand nets.

"We had to pay careful attention to the length of time spent under water, because if we got the bends, the closest decompression chamber was 2,500 miles away. We used the *U.S. Navy Diving Manual* as our guide, and then worked under water only two-thirds of the suggested time for that depth. Our average total length of diving time every day was 45 minutes. When we had exhausted our underwater time, it was usually already well into the afternoon and time to return to shore.

"As soon as we got back, we would immediately put the compressor to work building up air for the next day. At the end of two months, however, our compressor broke down, forcing us to have our air tanks filled by a commercial compressor on the island. This was a bit of bad luck, because it was responsible for both Star and myself suffering a bout with carbon monoxide poisoning. We were knocked out for about ten days, feeling weak, extremely dizzy, and showing evidence of the blue color associated with carbon monoxide poisoning.

The poisonous dorsal spines of this stone fish can cause death

"When the fish were brought up into the boat at the collecting site, Christine would immediately put them in a can filled with a formalin-water solution. The next morning after breakfast, I would place the hardened specimens in formalin-filled plastic bags with appropriate labels and collecting information. These bags were, in turn, inserted into cans of formalin, ready for shipment to the Museum.

"After each day's collecting, I would write up my field notes. Towards evening, I headed for the Faratea Hotel in Afaahiti—about two miles from my bungalow—for a leisurely dinner. Each evening I returned to my bungalow to read or write letters by the light of a Coleman lamp, for there was no electricity available, and generally turned in fairly early to be ready for another day's work."

As a collector, Watkins had to be constantly on the alert for dangers that are easily forgotten when one is absorbed by the island's loveliness. These dangers included the sharks, and the stone and scorpion fishes that inhabit the ragged reefs surrounding the island, as well as the stinging corals which emit a chemical substance that painfully burns anyone touching it. Early in his stay, Watkins burned a leg and his hands on these corals. After this experience, he always wore a heavy glove on the hand he used for steadying himself while diving near the bottom.

Watkins found the Tahitians to be an exceedingly warm and friendly people. When I asked him if he would recommend the island to vacationers, or to those looking for a place in which to retire, he summed up his feelings:

"There is a favorite saying of those who have spent any time on the island—two weeks are too long, and a year is too short.' "

THE WEDDELL SEAL

JOSEPH CURTIS MOORE
CURATOR, MAMMALS

THE ANTARCTIC seal that was named for the explorer, Weddell, inhabits the desolate south polar shores. Of five species of seals in the family *Phocidae* living today in the Antarctic seas, only the Weddell has adapted to life underneath the ice shelf anchored to the shores of the continent. To breathe in this environment, the animal must maintain open holes in the ice throughout the dark, bitter winter. As new ice forms about a breathing hole and threatens to close it, this engineer-seal takes the edge of the ice in its mouth. With its upper canine teeth resting firmly on the rim, and its lower canine teeth gently pressing from below, the seal swings its head from left to right until the ice is sawed through or breaks.

By adopting this technique for maintaining contact with the air, the Wed-

dell seal can survive, and on fish and squid thrive, however far open sea may retreat. This ability to live in the shore environment appears to relieve the animal from the necessity of contending with other species for food. It also makes the Weddell safe from attack by the killer whales that prey so fiercely on other seals.

For this success, the Weddell pays a certain price. Its teeth have not evolved sufficiently to amplify their efficiency in cutting ice. In time, the teeth employed in sawing ice begin to wear. When wear progresses past a certain point, the inner core of the tooth becomes exposed, and the tooth may die, loosen, or fall out. Infection then sometimes extends into the bone and brings about necrosis there and loss of other teeth. When the canines are lost or become too worn down to saw ice, a seal must live uncertainly by getting air at holes maintained by other seals, or die.

VERY early in the Antarctic spring, gravid females emerge from the sea and haul out on the ice where it is fast to the shore. After four weeks, they give birth to their young. Though usually independent of each other, their common requirements in these hostile environs now lead the females to form aggregations in the limited number of places suitable for rearing the young. Within these aggregations, each mother-young unit avoids interactions with others, except when defending its space.

In that harsh habitat, the baby Weddell seal shows unusual precocity. Long before birth its milk teeth resorb and the permanent canines erupt. Emerging in seven short minutes of birth from the warmth of the womb to the Antarctic ice, the newborn seal immediately opens its eyes and begins to progress on the snow. Already it weighs 65 pounds and measures fully half the 9-foot length of the adult.

During the seven weeks that it suckles, the young Weddell seal grows to four times its weight at birth. While the young one gains 185 pounds, its fasting mother loses an estimated 300 pounds. The females distinguish their own sucklings and fiercely defend them from too close an approach by intruders of whatever kind.

Both pairs of limbs are used when the pups first attempt to progress on the ice, but soon they learn to employ only the forelimbs. These are moved in unison, dragging the rest of the body along. The foreflippers of the baby seal are large and strong but seem diminutive in the adult and are not used in terrestrial locomotion except by emaciated animals (for example, the adult females at weaning time). In a few days the young seal learns to arch its back to pull its pelvis forward. After two or three weeks, the pup begins to move on land in the fashion of the adult, using neither fore nor hind limbs. The back is arched, dragging the pelvis toward the front; then the back straightens, sliding the thorax forward.

During the second or third week after birth the young Weddell seal begins to molt off the woolly coat in which it was born. The process takes a month and provides the animal with a fresh pelage of black and white just like that of a newly molted adult. During the same period, the young seal enters the water of the breathing holes and begins to swim. Thus, in the seven weeks between birth and weaning, this precocious seal has acquired all of its permanent teeth, quadrupled its weight, attained the adult mode of locomotion on ice, donned the adult coat, and learned to swim.

During the suckling period, there may be some predation upon the young by leopard seals. But a far more devastating danger often threatens the seven-week rookery period. If strong winds and heavy seas break up the shore ice of the rookery while it is in session, as many as half of the young may be lost. The mothers, with their surviving young, may then take refuge in some more sheltered bay on ice that is still anchored to the shore. These apparently severe losses are evidently not dangerous to the survival of the species, however, for if they were, one might expect an evolutionary adaptation to emerge in which the more sheltered rookery sites would become the primary choice.

Adult male Weddell seals may be entirely absent from the rookery during the first three weeks after the young are born, but as the time for weaning the young approaches, the males begin to haul out, appearing as sleek and fat as the females are gaunt. The males continue to feed until the young are weaned, when the mothers are free to feed again and ready to mate. The males fight at this time, presumably for the favor of the emaciated females, but both fighting and mating take place in the water and have been little observed.

IN SUM, the Weddell seal looks like a fat, animated nine-foot cigar. In water it is active and graceful, but on land the adult progresses like a caterpillar with no feet. The Weddell lives along the shores of the Antarctic subcontinent. In winter it catches its meals of fishes and cephalopods under the ice, and maintains breathing holes by a special technique of sawing the ice with its canines. In summer the seal feeds near shore and suns on beaches or smooth rock. The precocious young are born on fast ice and get ready for life under water in seven weeks. The social structure of the rookeries of this species seems limited to mother-baby relationships, and territory defense by the mothers. The males time their arrival on this domestic scene with the weaning of the young and concurrent receptivity of the females. Courtship is performed in the water, and during this period the males are violently competitive with their fellows.

FEATURED EXHIBIT FOR JULY

Complementing the Museum's new exhibition on Antarctica (see cover and page 8) is the exhibit-of-the-month for July, a habitat group of Weddell seals. Members of this species are the only mammals that inhabit—for a few weeks each year—the desolate shore ice of the Antarctic continent. The specimens on exhibit were collected by the Second Byrd Antarctic Expedition and are on view in Hall N, "Marine Mammals," on the Museum's ground floor.

Glaciologists at work in an icy laboratory 115 feet deep in an Antarctic crevasse

THIS MONTH'S COVER—

from a new exhibition on

ANTARCTICA

THE WHITE CONTINENT

"PROTECTED by treacherous seas, howling blizzards, deep crevasses, and bitter cold . . . Antarctica has resisted many assaults by curious men." These words by Rear Admiral George Dufek, U.S.N. (Ret.), former Commander of the United States Naval Support Forces in Antarctica, are dramatically expressed in this month's BULLETIN cover. Pictured is a seismologist, whose breath turns to frost as he produces shock waves on the earth's surface to gain information about structures below the surface. By the noted Swiss photographer, Emil Schulthess, the cover photograph and the one on this page are from a series of vivid portrayals of scientists at work in the Antarctic on display in the Museum's new exhibition: "Antarctica —The White Continent."

A tribute to scientific accomplishment on the world's least-known continent, the exhibition can be seen in Hall 9 on the Museum's first floor. It reveals current progress in surveying and mapping the continent; studying its animal and plant life in both their fossil and living forms; analyzing seismic soundings to measure the thickness of ice; investigating the lines of force of the earth's magnetic field; and understanding Antarctic weather.

The problems of carrying on scientific research under extreme weather conditions are projected not only through photographs, but in paintings, models, display of scientific instruments, and the reproduction of an actual Antarctic camp. Through this life-like scene, the viewer gains an appreciation of man's dependence upon survival clothing and equipment to maintain his all-out assault upon the frozen desert. The role of nuclear power in the scientific probing of Antarctica is demonstrated in models of the nuclear power plants at Byrd base and McMurdo Sound. A slide presentation, accompanied by taped dialogue, describes the Byrd base in detail.

Individual exhibits have been provided by the National Science Foundation, the U. S. Geological Survey, the U. S. Information Agency, the U. S. Navy, the U. S. Weather Bureau, Artist Arthur Beaumont, the National Geographic Society, The Mariners Museum, the Office of Admiral Byrd, the Martin Company, and the Douglas Aircraft Company. "Antarctica—The White Continent" will be on view through September 2.

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CHICAGO NATURAL HISTORY MUSEUM

Bulletin

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Douglas Lay and Mrs. Street atop the ancient caravanserai of Shah Abbas. Mount Demaverd, Iran's highest mountain, lies 70 miles to the n

EXPEDITION TO IRAN

A Final Report

By William S. and Janice K. Street

For earlier reports by the Streets on their mammal collecting expedition to Iran, see the November and December, 1962, and the January, 1963, issues of the BULLETIN

Nikshahr

December 6, 1962:

Our next stop, after very successful collecting at Bujnurd, was the village of Zabol near the Afghanistan border. We had been told that we would not get much at Zabol, but the information proved to be wrong. The villagers gave us so much cooperation that we had no time to hunt or collect on our own. Douglas, Niqui (our taxidermist), Jan, and I were all busy skinning and mounting animals as well as constantly running out of the tent to buy some new lizard, snake, or mammal.

Leaving Zabol we traveled to Zahidan, the capital of Baluchistan, arriving on November 25. We left the next day for Iranshahr, 250 miles south. There we dressed up and visited the district governor. He promised us help in hunting, and the next day three gendarmes arrived—two to go sheep hunting in the mountains and one to help us find the local species of gazelle. I sat on top of the car, holding the 12-volt beamlight in one hand and the shotgun in the other as we sought specimens of gazelle over the rough, rocky terrain. In four nights running we saw only one gazelle and raced for it across the desert. Unfortunately, we stopped short of good range right on the brink of a five-foot drop-off, but that's about what it took to stop those cars of ours when in four-wheel drive. We ended up with two gazelles and four sheep. This, plus a two-day drive by Douglas Lay 200 miles farther south for the palm squirrel and a 100-mile night hunt for jerboa, gave us about everything we had hoped for from the area except the Asiatic black bear.

Tehran

December 26:

In Isfahan, we had our first puncture —right in the main square. Crowds collected around us as we made the repair, and I noticed that it was only a few minutes before a salesman of bread and muffins arrived to hawk his wares to our audience.

Colonel Shafti, the head of the Game Council in Isfahan, accompanied us fifty miles northeast of the city to a locality where we could get wild goats and sheep. The sheep are a separate subspecies, *Ovis orientalis isfahanica*, so it was particularly important for us to get specimens. We found the hunting very different from what we had encountered before. The mountains rise right out of the pebbly desert and are not at all connected with each other. Four men were needed to hunt and beat. Jan and I stationed ourselves in blinds at one end of the mountain while the local men climbed from the other end and worked toward us. This didn't work too well at first, but later, while Jan and I were at blinds about 8,000 feet up, we saw a number of goats, and collected four. The next day we got three ewes, then followed this with a ram.

In the meantime Doug was doing all

right, too. He collected a gazelle on the desert and a three-toed jerboa, and trapped a variety of small mammals.

Here we had Christmas Eve. We had bought some candies and presents for everyone and hoped our good Moslem friends would be tolerant of our Christmas. They were all included and remembered under Santa's tree.

Ahram

January 3:

Dr. Bahmanyar of the Pasteur Institute has joined us, along with one of his "mousers"—a man who has been collecting mice for the Institute for 15 years. The doctor wants to see how we do our collecting and particularly wants to learn techniques for getting bats. The Institute now intends to study these for rabies, just as they have been studying mice for the plague. So Doug and Dr. Bahmanyar will drive to Shiraz and then southeast to Jahrom, over 200 miles away, where it is reported that there are huge caves of bats.

Map showing collecting localities of the Street Expedition

Tehran

Februrary 5:

After our bat-hunting trip out of Shiraz, we stayed in Ahram near the Persian Gulf long enough to collect sheep, goats, gazelles, foxes, mongooses, and various kinds of mice. Shadgar, near the Persian Gulf, was to have been our next stop, but we weren't too sure of the roads and found ourselves driving through date groves that were criss-crossed by irrigation ditches so deep and narrow that someone had to be constantly in front to direct the driver. About a half-hour of this and we turned around and tried a different route, but found nothing but empty desert. Finally we gave up the whole idea of Shadgar, drove around through Abadan and followed the road northward. About twenty miles south of Shush, we again made a foray into desert country marked "unexplored" on our maps and promptly got lost. Too tired to continue, we rolled out our sleeping bags and went to bed under the stars. Through all our wanderings, we collected some interesting foxes and rabbits, as well as one of the jerboas we wanted and some mice.

Back on to the road to Kermanshah, we stopped at the city of Shush. Here French archaeologists are digging out the old city. In one place they are down about 60 feet, through 12 or 13 civilizations and 3,000 years of history. We watched from the top of the dig and could see skeletons of ancient people being carefully placed on raised tombs that had been painstakingly excavated. In another place columns and stone carvings have been unearthed. The archaeologists presented Jan with one of the old building bricks, which she guards zealously. I hope we get it back safely, but I am wondering how a 3,000-year-old brick will look in our Seattle environment.

Upon our arrival at Kermanshah we looked up a missionary, Mr. O. C. Burns, who lives with his wife and young children about an hour's drive from the city. Mr. Burns, appreciative of collecting for science, took his gun and went after specimens with us. Our stay was only three days, so we were content with foxes, rabbits, wild cats, wolf, mice, shrews, and bats. We enjoyed being with the Burns family and seeing the unselfish work they are doing for Iranian orphan children.

Southeast of our next—and last—stop at Tehran, Doug collected a fox different from any we had yet found. We also picked up several fine specimens of a small jerboa. Here is an example of the kind of extension of range knowledge we've accomplished. Previously this little animal was known only from southeast Iran, and we collected six in the sandy desert around Nikshahr, which checked with known information. But when we also found it in the desert around Isfahan, this was a range extension north and west of several hundred miles. Now we have also collected it within 80 miles southeast of Tehran, also in the desert, so perhaps this little animal is very widely distributed but in desert areas seldom traveled or collected in.

About 75 miles from Tehran, we stopped at a walled caravanserai built by Shah Abbas about 350 years ago, on the old caravan trail from Ishfahan to Tehran. Camels still travel this trail, transporting fuel of desert weeds or charcoal. Mostly, however, the local shepherds, with their sheep and goats, are

(*Continued on page 5*)

CHICAGO NATURAL HISTORY MUSEUM *News*

Geologist Views Antarctic Exhibit

Dr. Campbell Craddock and his children

A plane crash on the bleak mountains of northwest Antarctica brought home to Dr. Campbell Craddock, a recent Museum visitor, the value of the survival equipment displayed in the Museum's current exhibition on "Antarctica: The White Continent."

Craddock, an Associate Professor of Geology at the University of Minnesota, has lived in Antarctica from October through February for the last four years. He is in charge of a team of geologists who are studying the structure of the Ellsworth Mountains. While in Chicago last month, he brought his family to the Museum to see the equipment that kept his party alive after the crash.

"We were in a two-engine plane like the one shown in the exhibit of the first plane landing on the continent," Campbell recalled. "I was in the co-pilot's seat when the landing gear collapsed as we came in. Fortunately no one was hurt, but we knew we had several days ahead of us before a rescue crew could reach us from Byrd Base.

"Our equipment for this kind of emergency included a battery powered radio with a range of 500 miles. We also carried what the military calls a 'barren lands tent,' which we set up, using snow to weight down the edges. Our rations were mainly dehydrated and canned foods, with some freeze-dry meats."

Examples of this equipment, as well as the special clothing designed to protect the wearer against the coldest temperatures in the world, are shown in the exhibit. However, instead of the sleds on display, Craddock explained that when he returns to Antarctica this fall, he and his 16-man team of geologists will be using motor toboggans as their main means of transport in the field. These vehicles, propelled by a revolving track that drives the toboggan along on skis, can tow two regular sleds behind them.

The long-range goal of Dr. Craddock and his colleagues is to determine the geological structure of northwest Antarctica. This fall they will continue studies to determine whether the Ellsworth Mountains are a continuation of the Andean range. Naturally, Dr. Craddock was particularly interested in the exhibits showing the status of research on the south polar continent. These include a display, prepared by the National Science Foundation, that summarizes the latest information on the fossil and living plants and animals of the continent, and describes current research on the depth of the ice cap and the earth's magnetic field. Other exhibits use colored slides and taped dialogue to describe the nuclear power plant on Byrd Base, and to show how research is carried on in laboratories carved 115 feet deep in the ice.

"Antarctica: The White Continent" can be seen through September 2.

Distinguished Summer Visitors

Visitors to the Museum are often amazed at the acres of exhibition halls filled with a prodigious variety of materials from all parts of the world. Yet all the materials displayed represent less than two per cent of the Museum's total collections in the fields of anthropology, botany, geology, and zoology. The remainder, numbering many millions of specimens, is housed in laboratories and filed for easy reference in areas not open to the general public.

These research collections, however, have their own public—the stream of scholars and scientists who come to study specimens related to their particular fields of interest.

This summer, as usual, the roster of visiting specialists has grown each week. Following are some of those who have visited the Museum from other countries during the months of June and July.

Thor Heyerdahl, author of *Kon-tiki*, recently spent a week end studying the Department of Anthropology's Oceanic collections. He has just recently published the monumental work, *The Archaeology of Easter Island*, and was particularly interested in the Museum's materials from that island. Heyerdahl was assisted at the Museum by Phillip H. Lewis, Curator of Primitive Art.

The outstanding collection of South American frogs in the Division of Amphibians and Reptiles brought Dr. José M. Cei to Chicago from Chile, where he is on the staff of the Universidad Nacional de Cuyo in Mandoza. Also from South America, Dr. Alphonse Hoge, of the Instituto Butantan, São Paulo, Brazil, has been studying our New World pit vipers.

In the wake of scientific meetings held recently in British Columbia, a number of European specialists made a special trip to Chicago to examine our collections and meet with our zoologists. These guest scientists and their home institutions were: Dr. Walter Hellmich, Zoologische Sammlung des Bayerischen Staates, Munich, Germany; Dr. H. W. Parker, British Museum of Natural History in London; Dr. Guiseppe Scortecci, Instituto di Zoologia, University of Genoa, Italy; Dr. Ethelwynn Trewavas, British Museum of Natural History, Lon-

Chicago Natural History Museum
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don; Dr. Heinz Wermuth, Staatliches Museum fur Nuturkunde, Stuttgart, Germany, and Dr. G. F. de Witte, Institut Royal des Sciences Naturelles de Belgique, Brussels.

The Museum's collection of water mites—among the foremost in the world—drew Professor Taiji Imamura from Japan, where he is on the faculty of the Department of Zoology at Ibaraki University in Mito. Professor Imamura is an internationally recognized authority on the classification and biology of these mites. He and his colleagues are particularly known for their discovery of an interesting "relict" fauna of aquatic organisms that is restricted to shallow wells and the nearby underground waters. The Museum awarded Professor Imamura a Thomas Dee Fellowship to assist his studies here.

Mr. Yen Liu, Director of the Taiwan Provincial Museum, is currently at the Museum to gather general information on museum techniques and administration. Almost a daily visitor since the beginning of the summer, Mr. Liu is in this country on an UNESCO international grant in the field of museology.

Research Associate Honored

Word has been received that the newly constructed science building at Illinois Wesleyan University has been named in honor of the distinguished botanist, Dr. Earl Edward Sherff, who is a Museum Contributor and Research Associate in Botany. A portrait of Dr. Sherff has been placed in the lobby of IWU's modern Earl Edward Sherff Hall of Science, and a complete collection of his works is in the university's science library.

Dr. Sherff's association with Chicago Natural History Museum dates back to 1911, when he began independent collecting for the Museum. In 1936, he was appointed Research Associate in recognition of his outstanding botanical work and his contributions to the herbarium of plant specimens and photographs of type specimens. Earlier, he had been named a Museum Contributor (one who has given $1,000 to $100,000 to the Museum in money or materials).

Ten of Dr. Sherff's many published works have been printed by the Chicago Natural History Museum Press. Those most recently published are *Hawaiian Pittospora*, *Some Mexican Coreopsideae*, and *A Note on Xylosma hawaiiensi Seem.*

In addition to his world reputation in the field of systematic botany, Dr. Sherff has also served, during the past 45 years, as an instructor and administrator at high school, college, and university levels in Michigan and Illinois.

Retires

Mrs. Hilda Nordland Damsgaard, assistant recorder in the Division of Publications, has retired after 23 years as a Museum employee. Mrs. Damsgaard was born in Norway and came to this country early in the 1930's. Her work for the Museum began in the Division of Printing.

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Members are requested to inform the Museum promptly of changes of address.

Expedition to Iran

(*Continued from page* 3)

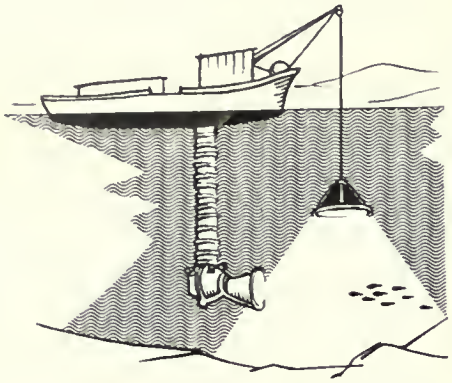
the only ones to stay in the castle at night.

From the castle, we could see the snow-capped Elburz mountains, probably 100 miles away. We drove several kilometers to a spring in the mountains to examine an old aqueduct built out of limestone rocks hollowed out and fitted together by hand. This aqueduct carried a stream of water, probably two inches deep and five inches wide, more than 12 kilometers to another old resthouse and on to the caravanserai of Shah Abbas. To collect stones that big, and to make this aqueduct hundreds of years ago, must have taken years of work or thousands of men.

All the way back to Tehran the weather was beautiful. We are now finished with our collecting in the field and are occupying ourselves with the disposing of unneeded gear, taking care of "thank you's" due to those who have helped us, sorting out our gear, and getting things packed up for final shipment. We are grateful for the help and cooperation that we have received from so many people in Iran. Difficulties and frustrations were at a minimum, thanks to the help of the Iranian Game Council, the CARE organization, and the Pasteur Institute. We leave personal friends behind and we think we have made some friends for the Museum.

So the collecting part of this expedition signs off, and scientific study of its results will now begin. "*Hoda hafez*" (goodbye; literally, God be with you). "*Matah shakeran*" (thank you for being with us).

FEATURED EXHIBIT FOR AUGUST



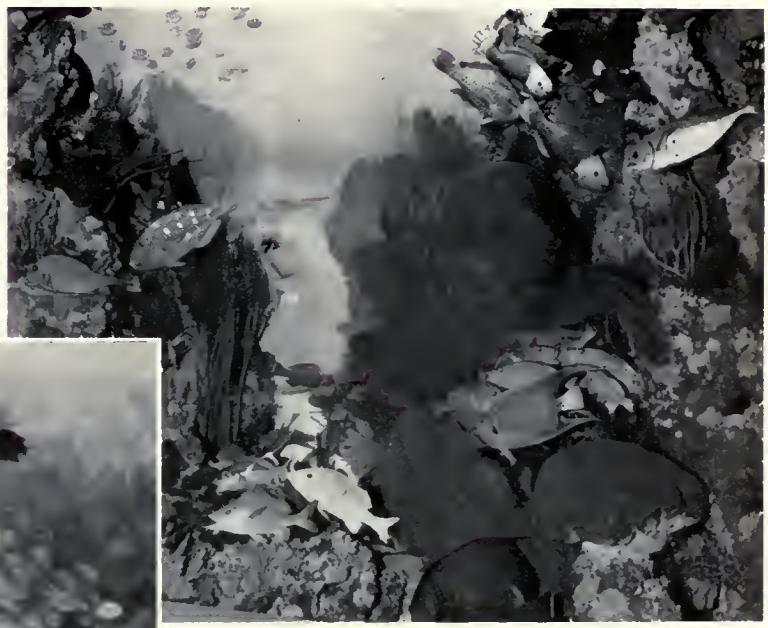
The Bahama Coral Reef

Loren P. Woods, Curator, Fishes

CORAL reefs are the busy, crowded cities of the seas. Their most striking feature is the great abundance and diversity of their animal population. In this respect, a coral reef may be compared with a tropical rain forest, where the environment is relatively stable and the competition is between species rather than with the elements. In such a biologically controlled (as distinguished from a physically controlled) environment, large numbers of species coexist without one ever becoming dominant.

Some of the animals of the reef are attached to it like plants, some burrow into the soft substrate deposited by other animals and by calcareous algae, while still others crawl or swim over the surface. Fishes, large and small, are everywhere. Many of the fishes are brightly colored and often in addition have bold, contrasting patterns of red, blue and yellow, set off by markings of intense black and pure white. The colors of the corals and sponges are more subdued but also display a great variety of hues.

THE REEF corals of the Bahamas grow luxuriantly in the clear warm waters reached by the side currents and eddies of the Gulf Stream. Although the variety and color



Below: Coral reef fishes photographed from the undersea diving chamber developed by J. E. Williamson.

Above: A section of the Museum's Bahama Coral Reef exhibit, reproduced with the aid of undersea photographs like the one on the left.

Upper Left: Drawing of Williamson's diving chamber.

of corals in the West Indian reefs are not equal to those of the East Indian, the massive brain corals, branching staghorns of several shapes, and fine-pored corals present a confusing and interesting seascape very different from any landscape. In place of shrubs and trees there are sea fans and sea feathers which, like plants rustled by balmy breezes, bend and wave in the underwater currents. These undersea forms, however, are not plants but animals related to the corals. Other animals such as cup and chimney sponges and encrusting bryozoans serve as ground cover.

The reef fishes may be divided roughly into three groups according to the time they are most active. One group feeds at night, hunting widely and individually over the reef. During the day some of these night predators, like the nocturnal morays, hide in holes. Others, like the striped grunts, lie crowded together in sheltered places.

The active, diurnal sergeant majors, parrot fishes, wrasses, angel, and butterfly fishes browse on the reefs or dart about investigating every activity, ready to pick up any scraps of food that may float free from a larger fish's meal. At night most of these diurnal fishes retire to a crevice in the coral or else burrow into the loose sand of the bottom. Some of the parrot fishes even spin a thin mucous cocoon that fully covers them when they settle for the night.

Fishes of the third group, including several kinds of snappers, are more likely to be hunting at dawn and dusk.

Of course there are many exceptions. A moray may be lured from its hole during the day by a particularly tempting bait. And though they normally feed at night, snappers and grunts will also eat during the day. The daytime aggregations of grunts are not really asleep, but resting, and are readily disturbed. Fishes and crabs that hide away in the sand during the day may be uncovered by trigger fishes deliberately searching out buried crabs.

Then there are those fishes, not normally reef inhabitants, which come in from open waters to forage on the reef. Active day and night, with no respect for time, are the large tiger sharks. Often accompanied by several remoras, the sharks search through the channels between the coral stacks, driving out sting rays and eagle rays. Amberjacks, which travel in schools, cruise over the tops of the reefs looking for silversides and round herring—small fishes that are enormously abundant on the reef, where they seek the shelter of its shallow water. When these predators appear, most of the typical reef fishes scatter and disappear into the nearby hiding places.

THIS ever-changing life of the coral reef has been caught in an exhibit that fills the west wall of the Museum's fish hall. The studies for the exhibit of the Bahama Coral Reef were made in the spring and summer of 1929, the materials being collected with the help of Mr. J. E. Williamson, a pioneer in undersea motion picture photography. Williamson had developed a unique diving chamber suspended from a barge (see drawing opposite). This chamber, which could be entered from the surface, was large enough for a photographer to work in comfortably for an extended period of time, taking pictures of reef details or various fishes without disturbing them.

Mr. Leon L. Pray, then a Museum staff member, spent 10 weeks in the Bahamas with Williamson, noting and recording the actions and changing colors and patterns of the reef fishes as they rested or moved about. Using his numerous photographs, along with carefully collected and preserved corals, gorgonians, sponges, crabs, and other invertebrates, a portion of the reef with its colorful inhabitants was reconstructed. The group was finally completed in 1932.

One of the largest habitat exhibits in the Museum, the Bahama Coral Reef is an authentic and outstanding record of the most conspicuous features of life on a coral reef.

Large tiger sharks are shown foraging between the coral stacks. From the Bahama Coral Reef exhibit.

Museum Begins Search for AUSTRALIAN FOSSIL MARSUPIALS

THIS MONTH'S COVER

A drowsy koala is photographed at Taronga Park Zoological Gardens in Sydney, Australia. This unique arboreal species—the only one representative of its genus and sub-family—is one of Australia's pouched mammals. Koala is an aboriginal word meaning "no drink." Normally the koala obtains sufficient moisture from the leaves of certain gum (Eucalyptus) trees on which it feeds. (Photograph courtesy of the Australian News and Information Bureau.)

WILLIAM D. TURNBULL, the Museum's Associate Curator of Fossil Mammals, leaves for Australia this month to begin a search for the remains of prehistoric marsupials and other mammals inhabiting that continent in the Cenozoic age, 11 thousand to 65 million years ago.

The collecting and study trip is being undertaken in cooperation with Ernest L. Lundelius, Jr., Assistant Professor of Geology at the University of Texas. During their eight months in the field, the two paleontologists hope to uncover a fossil record of marsupial mammals that will help to answer two unsolved questions about this unique fauna: When did marsupials first arrive in Australia? And what patterns of their adaptive radiation can be traced which would show when and how these forms began to occupy the various ecological niches, or types of environment, available to them on the Australian continent?

THE marsupials, whose living Australian forms include—among a host of varieties—the familiar kangaroos, wombats, and koalas, carry their young in abdominal pouches on the mother's body. They are considered by zoologists to be lower on the scale of evolution than the placental mammals, whose young develop within the internal placenta, or womb, of the mother.

The remarkable parallelism between Australia's pouched mammals and the higher mammals of other continents has long intrigued zoologists. Through studies of the fossil record, it has been possible to trace most of the early history of placental mammals on the various continents of the world. This record shows, for example, when placentals began to live in trees, to burrow under the ground, or to take advantage of available vegetation by grazing.

In Australia, however, where marsupials were—throughout most of the Cenozoic—the highest mammalian forms to occupy the available ecological niches, little fossil material has been collected. Consequently, there is a serious gap in knowledge about the history of adaptive radiation of Australian marsupial species.

CONCENTRATING their search in the southeastern part of the continent, including Tasmania, Turnbull and Lundelius expect to do two main kinds of prospecting, each of which should yield new information about the Australian fossil fauna.

The first method involves careful examination of certain sediments associated with lignite and coal deposits. In these sediments, the researchers hope to find suitable fossil material of the right age which could clarify the evolution and early history of various kinds of pouched mammals.

A second technique requires the sieving of tons of beach sands from beneath eroding sea cliffs that contain bedrock of the proper kind and age. Although the dating and correlation of marine strata have been well worked out, this is not the case for many Australian inland formations. A search will therefore be made of near-shore marine sites which may contain fossils of land mammals. A correlation of materials obtained from the two areas should make possible, for the first time, a more precise dating of Australian Tertiary faunas and events in early mammalian history.

WILLIAM D. TURNBULL joined the staff of Chicago Natural History Museum in 1946, and was named Associate Curator of fossil mammals in 1963. For the past few years he has engaged in intensive field work and study of Eocene faunas in the Washakie basin of Wyoming. He is the author of a number of reports on this research. He attended the University of Wisconsin and the Carnegie Institute of Technology, and is currently completing his thesis for the doctoral degree in paleozoology at the University of Chicago.

Ernest L. Lundelius, Jr., graduated from the University of Texas and obtained his Ph.D. in paleozoology from the University of Chicago. In 1954–55 he worked on Pleistocene and post-Pleistocene cave faunas in Western Australia under a Fulbright Fellowship. He has been Assistant Professor of Geology at the University of Texas since 1957.

Turnbull and Lundelius will be assisted in the research by their wives, both of whom have master's degrees in geology from the University of Chicago. Mrs. Turnbull will be supported in the field by a Thomas Dee Fellowship awarded her by the Museum. The overall research is being aided by a grant of $26,100 from the National Science Foundation.

PAULA R. NELSON

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CHICAGO NATURAL HISTORY MUSEUM

Bulletin

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Maya incense burner.
Pottery. 13½ inches high.
British Honduras. Ca. 800 A.D.

FEATURED EXHIBIT FOR SEPTEMBER

A Maya Ball Game

Maya ball player in full uniform. Clay figurine in Hall 8, Case 22.

Donald Collier, Curator
South American Archaeology and Ethnology

Photographs for cover and this article by John Bayalis and Homer V. Holdren

When the Spaniards reached the West Indies at the end of the fifteenth century, they found the Indians playing a game with a solid rubber ball on a court surrounded by low earthen mounds. This lively, bouncing ball about six inches in diameter was a novelty and great wonder to the explorers, for rubber was unknown in Europe and the only balls in use there were of leather filled with hair or inflated with a bladder. Columbus took one of these balls back to Spain from his second voyage. Later, the Spaniards encountered the rubber ball game in Mexico, and in 1528 Cortez, conqueror of Mexico, demonstrated the game before the court of Charles V. The Spanish chroniclers have left us several accounts of the game as it was played in different parts of Mesoamerica, and much additional information about it has come from archaeological excavations.

Among the lowland Maya the ball game was as important as anywhere in Mesoamerica. The Maya ball court consisted of a paved alley about 25 feet wide and 75 feet long bounded on either side by a masonry bench and a sloping or vertical wall. At either end the alley opened into an expanded field bounded by a low wall or a line of stones set flush with the surface. Thus, the court had the shape of a capital "I." Various carved stones, which served as markers governing the play, were set in the floor and side walls of the court.

Maya ball game at Chichen Itza, ca. A.D. 850. Diorama in Hall 4, Indians Before Columbus.

The game was played by two teams composed of two to ten men each. They used a solid rubber ball which was five to eight inches in diameter and weighed about five pounds. The play was a combination of basketball and soccer. The players kept the ball in motion by meeting it with their hips, thighs, forearms, and possibly with their shoulders and heads, but never with their hands. Scoring was done by striking the side markers or forcing the ball into the opponents' end zone. A point was also scored if the ball went dead in the opponents' side of the court.

The accompanying illustration shows a reconstruction of a game in progress on a ball court in Chichen Itza in about A.D. 850. This is a late form of Maya court having stone ring markers set in the side walls. This form of goal, through which the ball had to be driven to score, was apparently adopted by the Yucatecan Maya as a result of Toltec influence from central Mexico.

In order to protect themselves from the violent impact of the heavy rubber

(*Continued on page 8*)

A New Museum Program for CHILDREN *of* MEMBERS

A Museum workshop on rocks, minerals, and fossils

MANY OF our younger Museum Members—as well as children and grandchildren of Members—have expressed their eagerness to learn more about the various fields of science and anthropology in which our Museum scientists and scholars specialize. To these youngsters we now offer a new program designed to enlarge their knowledge and enrich their understanding of nature and man.

Five different workshops, covering major Museum fields of study, have been planned for Saturday mornings during October and November. Boys and girls will meet with our staff in small, informal groups where individual participation can be encouraged and imagination stimulated through the handling of actual Museum specimens and materials. The workshops also include exhibits, motion pictures, discussion, and special demonstrations.

Each workshop will be given at 10:15 A.M., repeated at 12:45 P.M., and will last about an hour and a half. Children or grandchildren of Museum Members, 10 through 13 years old—and Museum Members in that age group—are eligible to enroll. To insure individual attention and participation, each workshop is limited to 45 boys and girls. Reservations are necessary, and will be accepted in the order in which they are received. Application may be made for the entire series or for specific sessions. Please use the application form enclosed. All reservations should be made by September 23. A confirmation will be sent to each applicant, and this confirmation will serve as the admission card.

October 5—"Insects"

Maryl Andre in charge

Insects are the easiest animals to collect and can be found almost anywhere —on the screens (especially at night), in gardens, trees, soil, plants, and in the air. There is a tremendous variety of insects; some are most beautiful and all are interesting. The workshop includes demonstrations on how to identify insects by using a "key," how to make and use a "killing bottle," how to construct a drying board, how to pin insects, and how to preserve and display them. Boys and girls may bring their own collections to work with or they may use our specimens.

October 12—"Indians of the Woodlands and Plains"

Harriet Smith in charge

In different regions, Indian tribes developed a life that fitted their kind of country by using materials furnished by nature. In this workshop, youngsters will handle these raw materials and see for themselves how their qualities were utilized in making actual Indian tools and equipment. Movies showing how tribes of the Woodlands and Western Plains were living when the settlers came give a basis for discussions comparing different Indian ways of life.

October 19—"Fall Leaves, Fruits, and Colors"

Marie Svoboda in charge

Fall is a period of rapid changes in the plant world as trees and other plants prepare for winter and spring. Seeds, fruits, and leaves are greatly altered in appearance, especially in color, and are often carried far away by autumn winds. "By their fruits ye shall know them" is an important rule to follow in the fall.

(*Continued on page 6*)

FIELD EXPERIMENT IN Sarawak

Robert F. Inger
Curator, Amphibians and Reptiles

In former years, expeditions were sent out by the Museum's Department of Zoology to collect specimens mainly in order to find out which animals occur in various parts of the world. Now, thanks to that earlier work, we have a much clearer idea of the geographic distribution of the world's fauna. As a result, field work can be directed to learning about other biological problems, some of which require several years of field observation. Working in the rain forest of Borneo, members of a Museum zoological expedition are currently attempting to solve one of these problems, related to the biological theory of competition.

Competition is an idea to which our society attaches merit. In general, we think that competition benefits society by forcing all of us to do our best at whatever is our particular activity. Biologists have for a century been concerned with competition, not merely because they, themselves, are people affected by competition in human societies, but mainly because the phenomenon is important in the process of organic evolution. "The survival of the fittest," a phrase that grew out of Darwin's work on natural selection, implies competition.

One of the corollaries of competition that developed in biological theory is the notion that two closely related species that live in much the same way cannot live in the same place. Because they have the same habits and need the same kinds of resources, the idea runs, such species would compete with one another and gradually one would drive the other out. This process is not visualized in dramatic terms, conjuring up an image of one species of snail chasing another out of a stream. Instead the biologist thinks in more realistic, though perhaps also more pedestrian terms: one species is better able to use the natural resources than the other and thus reproduces more successfully; greater success at reproduction enables the first species to get a still larger share of the resources; and so on, until only one of the two species is left.

This process is called competitive exclusion and has been an important element in the thinking of many biologists. Our best evidence for it is based on laboratory experiments. Unfortunately, we have little evidence that the process actually works in nature.

It was partly with the hope of learning something about competitive exclusion in nature that we established a camp, last September, far in the interior of Sarawak. Several closely related species of frogs lived in the small streams near our rain forest camp. These frogs, which may be found almost side by side, are about the same size, they have similar diets and breeding habits, and their tadpoles live together in small pools.

We spent two months estimating the number of each species that lived along three of these streams. Then we removed all frogs of species "A" we could catch in four nights from Stream 1 (actual name, Sungei Sekentut) and all of Species "B" we could catch in Stream 2 (Sungei Ensurai). We did not remove any frogs from Stream 3 (Sungei Serbong). Following the first removal, we continued for three months to make the type of observations needed for making a census. Then the removal step was carried out just as it was the first time and as it is being repeated every three months. Repetition of the removal phase is necessary because it is impossible to catch all of the frogs of one species at a given stream in a limited period of time.

These field experiments were undertaken in the hope that they would provide answers to the following question: Does the presence of one species of frog affect the number of a second, related species living along the same streams? If Species "A," which uses the same resources of food and space as Species "B," is unaffected by the presence of "B," its population numbers will not increase if we remove many of "B." Nor should the numbers of Species"B" increase following removal of Species "A," if "B" is unaffected by "A."

If these are the actual results of our experiments, we can say that at least in this case two closely related species using the same natural resources can live together. But—and this is an important condition—one must be reasonably sure that both species have been given enough time to show the effects of our tinkering with them.

For this reason the experiment must run for two years. A first field party, consisting of Dr. Bernard Greenberg, of Roosevelt University, Mr. F. W. King, a student at the University of Chicago, and myself, began the work in Sarawak

The zoological expedition's camp in the interior of Sarawak

F. W. King records data on Sarawak field experiments

in 1962. Only Mr. King remained in the field beyond November, 1962. This August, a second party left for Sarawak to carry on the work for a second year. The group consisted of Mr. William Hosmer, Atherton, Australia, Mr. James P. Bacon, a graduate student at the University of Chicago, and myself. Mr. Hosmer and Mr. Bacon will remain in the field for one year and I for only one month.

BESIDES continuing the experimental test of competitive exclusion, Mr. Hosmer and Mr. Bacon will continue other projects begun last summer that require more than a year of observation. One of these projects is the tracing of movements and growth of individual frogs and toads. We marked frogs and toads along the creeks so that when the marked animals are recaptured, they are easily recognized. When first caught, each frog was located relative to trees we had marked with metal signs. Movements of marked frogs and toads can be determined simply by comparing successive positions of the animals.

Analysis of our observations has scarcely begun, but we have been surprised at two adult toads that were first caught September 21, 1962. When last caught on May 26, 1963, each was exactly in its original position. During the interval the creek has flooded a number of times and the toads must have been forced to move on those occasions.

THE NEW WORK Mr. Hosmer and Mr. Bacon will initiate involves the reptiles and amphibians that inhabit the crowns of the trees. Collecting and observing the lizards, snakes, and frogs that live 100 feet or more above the ground pose real challenges. But by a combination of techniques using tree platforms, traps, and ingenuity, we expect to get information on this "last frontier" in the rain forest. Once this information is in hand, we should be able to approach our major goal—an understanding of the relations of the reptiles and amphibians to one another and to the rain forest in which they live.

CHICAGO NATURAL HISTORY MUSEUM *News*

New Fall Journey "Autumn's Golden Treasures"

The world of nature is truly a world of color, and at no place and at no time is this more evident than in the Midwest and in New England in the autumn. For this is the time of year when the entire countryside fairly blazes with hues. Yet, behind this gorgeous curtain of crimsons, scarlets, and gold, nature plays the far more important role of preparing for next spring's drama.

Seeds must be produced and set before the winter snows arrive; next year's leaf buds (which are already observable on the twigs) must be protected from the intense cold; most living processes must slow down or stop completely. These adjustments are necessary if plant life is to survive the winter.

"Autumn's Golden Treasures," the Raymond Foundation's Fall Journey for boys and girls, is available from September through November to acquaint youngsters with some of the familiar and colorful plants to be seen in the Chicagoland area. Journey sheets give directions for finding Museum exhibits on this subject and questions to be answered as the exhibits are studied. These sheets may be obtained at the north and south doors of the Museum and at the Information Desk in Stanley Field Hall. Completed questionnaires, deposited in the Journey barrels at either door, will be credited to each boy or girl participating in the Journey program.

A special exhibit, "Autumn's Golden Treasures," has been set up at the east end of Hall 25 (second floor, east) as the starting point for the Fall Journey.

Curator to Malaya

Dr. D. Dwight Davis, Curator of Vertebrate Anatomy, recently left for Kuala Lumpur in response to an invitation to accept a Visiting Professorship at the University of Malaya. His appointment will extend through January, 1964, and is supported by the Fulbright-Hays program which enables scholars and scientists from the United States to aid underdeveloped countries through university lecturing and advanced research.

Dr. Davis is well acquainted with Malaya, having conducted a Museum expedition there in 1958–59. During the coming months, he expects to study the relationships between the anatomy and behavior of primitive Malayan insectivores. These animals are not exhibited in zoos and are little known except from study skins.

In order to reach Malaya for the opening of the University's fall term, Dr. Davis was forced to cancel his scheduled participation in the XVI International Congress of Zoology held in Washington, D.C., last month. He was to have presented a paper on "Principles and Problems of Functional Anatomy."

The Museum was represented at the Congress, however, by Mr. Philip Hershkovitz, Research Curator of Mammals, who participated in a symposium on the evolution of the mammals of the southern continents. Hershkovitz reported on "The Recent Mammals of South America."

Watercolor Exhibition Of Common Mushrooms

Edible and poisonous mushrooms found in American woodlands are the subject of 40 watercolor paintings to be shown in Hall 28 during September. The watercolors are by the Czechoslovakian artist, Oscar Pejša. Each mushroom is identified according to its common English, German, Czechoslovakian, and scientific name.

A New Program for MEMBERS' CHILDREN

(*Continued from page 3*)

Participants will discover how to apply this guide in learning about some of the common plants of Illinois.

October 26—"Cave Man to Civilization"

Edith Fleming in charge

A movie on the life of the cave men, which focuses on their hunting of prehistoric animals, opens this workshop. In the following discussion-demonstration period, boys and girls will examine some of the real tools used by cave men thousands of years ago, learn how they were made, and compare them with tools of today.

November 9—"Rocks, Minerals, and Fossils"

Ernest Roscoe in charge

An introduction to rocks, minerals, and fossils is provided in this workshop. Motion pictures point out the main features of rocks and minerals and show how plants and animals become fossils. Techniques for identifying common rocks, minerals, and fossils will be demonstrated, and boys and girls will have a chance to practice their skills on actual, local specimens. Please bring a penny, a pen knife, and a small magnifier (if possible). All other materials will be supplied.

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Fall

FILM PROGRAMS

On Nature and People Around the World

Basque sword dancers. From the November 30th program on "France," by Ed Lark.

DESIGNED FOR ADULTS

NARRATED IN PERSON

October 5—America's Heritage, Our National Parks

James W. Metcalf

Yellowstone, the Grand Canyon, the Great Smokies, and Yosemite have become so popular over the years that many Americans are unaware of the existence of other National Parks. Yet, an abundance of such parks is scattered from Alaska, to Hawaii, to the Virgin Islands—each one beautiful, impressive, and distinctive. James Metcalf's program covers them all.

October 12—The Alpine World

Eric Pavel

A formidable barrier between Italy and its northern neighbors, the Alps have played a significant role in the historic development of Europe. What these magnificent mountains have meant to people in historic times, and how they affect travelers and those who live near them today, is the theme of Eric Pavel's film presentation.

October 19—Beautiful, Bountiful British Columbia

Cleveland P. Grant

What California is to the United States, British Columbia is to Canada. It is Canada's greatest fruit growing area, a country of mountains and fertile valleys. Here is the motion picture story, filmed by a conservationist, of a great land, swept from an Acadian to an atomic age in a single generation.

October 26—Life in Sweden

Hjordis Kittel Parker

Highlighting this colorful documentary of Sweden's people and places is an exciting and exclusive film sequence on the raising of the ancient warship, *Wasa*, the pride of the Swedish navy in 1628. The viewer shares the tension as the *Wasa* slowly emerges from the bottom of the Stockholm harbor, its ornate wood carvings and bronze cannons intact.

November 2—Ireland

Alfred Wolff

The warm friendliness, gentle humor, and pastoral ways of Ireland's soft spoken people set the tone for this film lecture. Wolff's camera skips from the wild, white beauty of the "Burren," to the isle's rolling green countryside, and on to the majesty of Ireland's cliffs and castles.

November 9—Quest For Adventure

Howard Murphy

A 10-month, 14,000-mile journey, recorded on 50,000 feet of film, formed the basis for this motion picture program. Through expert editing the film has been tailored to include only the most exceptional and stunning sequences. Among the ports of call are Acapulco, Cartagena, Curacao, Bermuda, the Azores, Malta, Athens, Istanbul, and Cannes.

November 16—Hungary and Bulgaria Today

Ralph Gerstle

Deterred by the political climate, today's traveler often bypasses Hungary and Bulgaria. Here is an opportunity to see how Bulgaria's Byzantine heritage and Hungary's western European origins have been curiously blended with current Soviet influences on culture, architecture, and economics.

November 23—Designs For Survival

William A. Anderson

The mystery of life's complex processes never ceases to challenge the imagination. The human observer, for example, who witnesses the struggle within the animal and plant kingdoms to perpetuate each species, sees pathos and comedy blended in a marvelous "design for survival." Through tens of thousands of hours of painstaking and patient photographic observation, William Anderson has captured the cyclic drama of survival in forest and sea.

November 30—France

Ed Lark

Outside the limits of Paris, and beyond the resort cities of the Riviera, there exists a France undiscovered by tourists who travel only to Europe's major cities. The "real" France comes to light in the provinces—reservoirs of highly individualistic, independent, liberty-loving people. These people and their country provide the focus for Lark's program.

All programs begin at 2:30 P.M. in James Simpson Theatre. Reserved seats will be held for Museum Members until 2:25 P.M.

Maya Ball Game

(*Continued from page 2*)

ball Maya players wore protective equipment not unlike that used by modern American football players. This consisted of a broad, heavy belt of leather or wickerwork, a leather hip pad, quilted kneepads, a heavy glove or gauntlet to protect the forearm, and a heavy helmet. This equipment is shown in the accompanying photographs of clay figurines depicting ball players. These figurines were excavated by a Chicago Natural History Museum expedition in British Honduras.

Maya ball players contending for the ball, which may be represented by the spherical object above one player's head. Clay figurine in Hall 8.

Although the ball game had many secular features, including heavy gambling by the spectators, it also had great sacred and ceremonial significance. Elaborate courts associated with special temples were built near the heart of the great ceremonial centers. The location of sacred sweat baths close to some of the courts suggests that the players purified themselves physically and spiritually in pre-game rituals. Elaborate symbolism was used in decorating the ball courts, and stone friezes show the players wearing ornate headdresses. Elaborately carved stone yokes and palm-shaped stones were used in ball game rituals. The Mexican form of the game, which was carried to Yucatan by the Toltecs, was associated with human sacrifice. The bas-relief frieze on the bench of the Great Ball Court at Chichen Itza shows the captain of the winning team holding the freshly severed head of the losing captain, who kneels facing his vanquisher with blood in the form of six serpents spurting from his severed neck. Between them is the ball, decorated with a skull symbolizing death.

The Maya game was connected with the Lords of the Underworld, who, according to a myth, had their own ball court, and with the Lords of the Day and Night. In Mexico Xolotl, twin brother of Quetzalcoatl, was divine patron of the game. Quetzalcoatl, god of knowledge, wind, and the planet Venus, and Xochipilli, god of love, flowers, games, and gambling, were also closely associated with the game.

In addition to the big-time ball games played in ceremonial centers, there is reason to believe that the game was played informally in every village and hamlet. The popularity of the game is shown by Montezuma's Tribute Roll, recorded in the Codex Mendoza, which states that Tenochtitlan, the Aztec capital, received 16,000 rubber balls annually in tribute from 22 towns in southeastern Mexico, the land of rubber trees.

The origin of the rubber ball game has not yet been determined. The oldest known Maya ball court, at Copan, dates from about A.D. 300. Clay figurines depicting ball players and dating from before 500 B.C. have been found at Tlatilco, near Mexico City, but there is no evidence that the specialized ball court was in use at that time. There is little doubt that the ball courts in the West Indies and in Arizona were derived from the Mesoamerican type, and that the elaborated Mesoamerican form of the game developed within Mesoamerica itself. But the origin of the rubber ball is not known. The ball and several basic features of the game were in use in pre-Columbian times in most of the Circum-Caribbean area and in lowland South America as far south as Paraguay, a distribution that coincides with that of suitable rubber trees. This wide distribution suggests great antiquity for the ball and the game, and they may have originated south of Mesoamerica.

(END)

THE BOOK SHOP

Maya Archaeologist

By J. Eric S. Thompson. University of Oklahoma Press: Norman. 284 pp., 22 figures, 16 plates. $5.00.

The author of this book, an Englishman, is the most distinguished living Mayanist. He is now Research Associate in Central American Archaeology at Chicago Natural History Museum, where he served as Assistant Curator of Central and South American Archaeology from 1926 until 1935, when he joined the staff of the Carnegie Institution of Washington. Thompson is a field archaeologist, historian of ancient Maya culture, and a leading specialist on Maya hieroglyphic writing. Among his numerous publications the most familiar to the general reader are *Mexico Before Cortez*, *The Rise and Fall of Maya Civilization*, and *The Civilization of the Maya*. The latter was published by the Museum and is now in its sixth edition.

Maya Archaeologist deals with the author's experiences as a field archaeologist in Yucatan, British Honduras, and Guatemala. Thompson's working life fell near the end of the pioneer period of Maya archaeology, the period of exploration, hardships, and discovery, of travel by muleback and dugout canoe rather than by jeep and plane. The account tells of the privations, the discomfort, the joys of unexpected discovery, the appreciation of nature, and the frustrations which make up the life of a field archaeologist. Above all, it is about the Maya Indians, who were his guides, packers, diggers, and companions, and for whom he feels great affection. It is all told with a wry but restrained sense of the humorous aspects of the various incidents. Interwoven in the narrative is much factual and interpretive material which adds up to a comprehensive view of Maya archaeology.

The book is illustrated with maps, photographs, and drawings, which include delightful sketches of Maya Indians by the Mexican artist, Jean Charlot.

DONALD COLLIER

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CHICAGO NATURAL HISTORY MUSEUM

Bulletin

Vol. 34 No. 10
October 1963

PARASAUROLOPHUS CYRTOCRISTATUS: A NEW DINOSAUR SPECIES

THIS MONTH'S COVER

A NEW DINOSAUR SPECIES

These crested dinosaurs are closely related to the the uew species

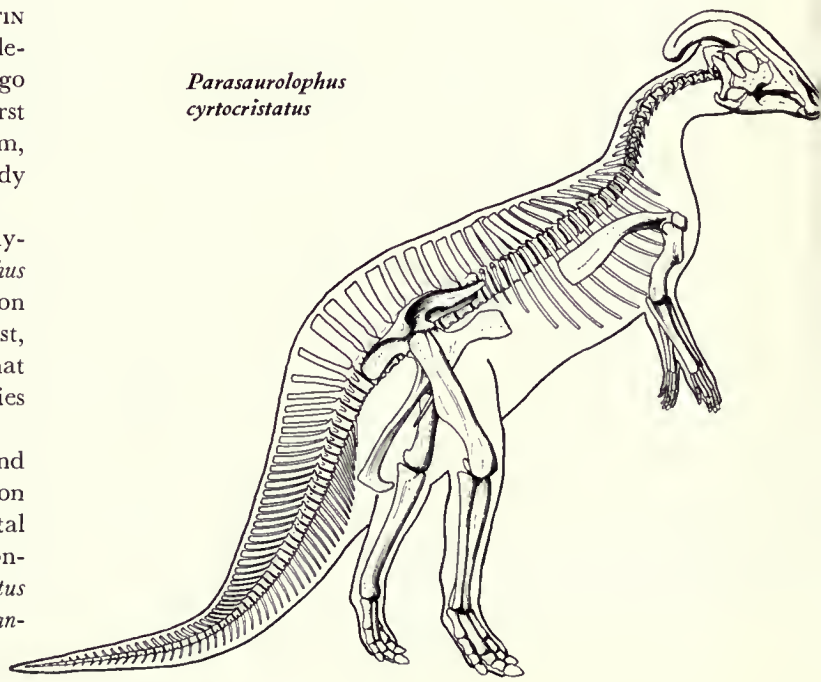
A previously unknown species of dinosaur, which roamed New Mexico during the late Cretaceous period (about 75 million years ago), is the subject of this month's Bulletin cover. The specimen, consisting of a nearly complete skeleton and fragmentary skull, is in the collection of Chicago Natural History Museum. It has been described for the first time in a recent Museum publication by Dr. John H. Ostrom, Assistant Curator of Vertebrate Paleontology at the Peabody Museum of Natural History, Yale University.[1]

Dr. Ostrom spent the last few summers in Chicago studying the new species, which he has named *Parasaurolophus cyrtocristatus*, in reference to the distinctive curved crest on the reptile's skull. It is on the basis of the shape of this crest, which differs from that of any other known dinosaur, that Dr. Ostrom has assigned the specimen to a new species category.

The Museum's specimen measures about 22 feet long and probably had a semi-erect height of 12 feet. An impression found of the skin of a related species suggests that the skeletal structure was covered with a tough and leathery hide containing hundreds of horny scales. In life, *P. cyrtocristatus* walked on its hind legs. When the fierce, land-living *Tyrannosaurus* came into view, the more peaceful *Parasaurolophus*, running on its rear limbs with tail and body stretched out parallel to the ground, probably made for the comparative safety of the swamps, rivers, and lakes near which it lived.

Like other crested dinosaurs, the newly described species was a swimmer, and several of its physical structures were useful in the water. The high tail, flattened at the sides, must have been an aid to swimming. There is evidence from closely related animals that the toes of the front feet were webbed.

Parasaurolophus cyrtocristatus



Tyrannosaurs advancing upon a herd of crested dinosaurs.
From a mural by Charles R. Knight in Hall 38.

The jaws of this herbivorous reptile ended in a duck-like bill, suitable for biting off plants growing in shallow water or on the banks of rivers. Behind the bill, on the sides of the jaws, were several rows of closely packed teeth that look somewhat like chisels fitted together tightly. As these teeth wore down, others already formed beneath the rows pushed up. The dinosaur may have had as many as two thousand teeth during its life.

There has been considerable speculation and debate among paleontologists about the function of the cranial crest which distinguishes the group of dinosaurs to which *P. cyrtocristatus* belongs. One popular hypothesis, taking note of this group's many adaptations to aquatic life, holds that the crest may have acted as a storage chamber for a reserve air supply which could be drawn on when the reptile was submerged. Dr. Ostrom has made an extensive study of a series of cranial crests and, using the Museum's specimen, has completed the first detailed dissection of this structure. His studies have led him to the conclusion that the crest served the purpose of heightening the animal's sense of smell by providing an increase in the total surface area available for olfactory tissue. Dr. Ostrom suggests[2] that a highly developed sense of smell might be particularly important to a group of peacefully browsing herbivores who had no obvious defensive mechanisms. Unlike many other dinosaurs, these creatures possessed no horns, no claws, no sharp teeth, no clubbed or spiked tail, and no bony armor. They certainly were not constructed for rapid flight, nor were they giants for their time. Presumably, their only defense against predators would have been to retire to the comparative security of inland water or swampy regions. However, the potential safety of such refuges would be contingent upon the slow-moving animal being able to detect danger well in advance of its arrival. Here is where acute olfactory sensitivity may have had significant survival value for the crested dinosaurs, just as it does for many modern mammalian herbivores.

The reconstruction of the 90-pound skull of the Museum's specimen which appears on our cover was photographed by John Bayalis and Homer V. Holdren of the Division of Photography. The model was made by Orville L. Gilpin, Chief Preparator of Fossils in the Department of Geology, during preparation of the skeleton for exhibition. When it became clear that the skeleton represents a new species and is the only one of its kind so far discovered, plans for its exhibition had to be postponed. The skeleton is now in the Museum's scientific collection where, as a valuable type specimen, it is available to paleontologists for study and future comparison with other individuals of its kind that may come to light.

P. R. NELSON

[1] Ostrom, John H., "*Parasaurolophus cyrtocristatus*, a Crested Hadrosaurian Dinosaur from New Mexico," *Fieldiana: Geology*, Chicago Natural History Museum, Vol. 14, No. 8 (July 31, 1963).

[2] Ostrom, John H., "The Cranial Crests of Hadrosaurian Dinosaurs," *Postilla*, Yale Peabody Museum of Natural History, No. 62 (June 29, 1962).

CHICAGO NATURAL HISTORY MUSEUM *News*

NEW TRUSTEE ELECTED FIRST VICE PRESIDENT

At a September meeting of the Museum's Board of Trustees, Mr. James L. Palmer, President of Marshall Field and Company, was elected a member of the Board and its First Vice President. In this position, he succeeds Mr. Hughston M. McBain, who had served as First Vice President since 1957. Mr. McBain requested that he be relieved of this responsibility due to the pressure of other business affairs.

James L. Palmer

A native of Waterboro, Maine, Mr. Palmer was graduated from Brown University and is now a Fellow of that institution. Subsequently he received a Master of Arts degree from the University of Chicago, where he served for fourteen years as a member of the faculty of the University's School of Business. During that time he acted as business consultant to a number of corporations.

He became affiliated with Marshall Field and Company in 1937, becoming a Vice President in 1940 and President in 1949. He is currently a member of the Board of Directors of Marshall Field and Company, Harris Trust & Savings Bank, International Harvester Company, and General Candy Corporation.

Mr. Palmer has also been active in civic affairs in Chicago. He was President of the Community Fund of Chicago from 1946 to 1949, and is a Director of the Chicago Lighthouse for the Blind, the Federal Prison Industries, the Chicago Central Area Committee, and is a Trustee of the Chicago Evening Club. During the war years he was a member of the Chicago Regional Manpower Advisory Committee, Chairman of the Chicago Committee for Economic Development, and Chairman of the Governor's Committee on Revenue Trends.

REGISTRATION FILLED FOR SATURDAY PROGRAMS

Registration lists are already filled for both morning and afternoon sessions of most of the new Saturday informal Workshops to be held during October and early November for the children of Museum Members.

If your child should be unable to attend any session for which he is enrolled please notify the Raymond Foundation at the Museum (WAbash 2-9410) so that this place may be opened to another Member's child on the waiting list for the Workshop on that day.

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STAFF PARTICIPATE IN SCHOLARLY MEETINGS

Dr. Joseph Curtis Moore, Curator of Mammals, is now on the first leg of a six-months' trip during which he will study specimens of beaked whales in museums around the world. Before leaving for London, his first stop, he participated in the International Symposium on Cetacean Research at Washington D.C., reading a paper on "Distribution and Diagnoses of Six Species of *Mesoplodon* that Strand on North American Shores." While in Washington he spent three days at the National Museum studying their series of the beaked whale *Berardius bairdi*.

George I. Quimby, Curator of North American Archaeology and Ethnology was a guest lecturer at the Conference on Underwater Archaeology held recently at the Minnesota Historical Society in St. Paul. His subject was 17th and 18th Century European trade articles used by the first explorers and settlers of this continent in their bartering with the Indians. Quimby is currently working on a chronology of the period based on the types of knives, beads, swords, and other articles used as exchange items by the earliest European in North America.

Mrs. M. Eileen Rocourt, Associate Librarian, and Mr. W. Peyton Fawcett, Associate Librarian, attended sessions of the 28th Annual Conference of the Grad

uate Library School of the University of Chicago, held recently at the University.

The theme of the conference was, "Library Catalogs: Changing Dimensions." Participants sought solutions to such problems as what format or combination of formats is most useful for a library catalog, and what kinds of materials and what classes of entries should the catalog include. These questions were probed in the light of increasing demands which scholarship and research are placing upon special libraries.

Dr. Austin L. Rand, Chief Curator of Zoology, was re-elected President of the American Ornithologists' Union at the Annual Meetings held in Gainesville, Florida, recently, at which he presided. His term will be for the year 1963–64.

MUSEUM ARTIST TO TANGANYIKA

Miss Susan Schanck, artist-preparator in the Department of Anthropology, departed last month for Dar es Salaam, Tanganyika, where she will spend the next two years as exhibit designer for the National Museum of Tanganyika. In this position she will be responsible for designing and installing exhibits in the museum's new building, which is now under construction.

Miss Schanck is working in Tanganyika under auspices of a Ford Foundation grant. An exciting aspect of her new position will be the planning of displays of some of the recent discoveries of Dr. L. S. B. Leakey. These include remains of a tool-making hominid, *Zinjanthropus*, who lived 1,750,000 years ago. Miss Schanck expects to take part in field trips conducted by the Tanganyika museum. While in Africa, she also plans to train a native Tanganyikan in display techniques, so that there will be a continuation of the museum's exhibition program when she returns to this country.

FEATURED EXHIBIT for October

Do you know ?

What is the largest broadleaf tree in North America?

What woods are used to make the finest golf club heads?

What conifers lose their needles like deciduous trees?

What kinds of forests covered North America before the coming of the white man?

What trees, once present in great abundance on this continent, are now extinct or fast disappearing?

The answers to these and many other questions about trees can be found in the Museum's featured exhibit for October, the Hall of North American Trees.

Within the hall, the attractive displays of trees and woods are arranged in the order of their botanical relationship. Each tree is identified by a model of a branch with its leaves, constructed by Museum artists and technicians to look convincingly like the living original. The bark and cross sections of the actual trunk of each species are also shown, together with boards revealing the typical grain of the wood; photographs of the living tree (most often the same tree) as it appears in the summer and winter; and a map of its distribution. Informative labels describe the main characteristics and economic significance of every tree displayed.

Other displays ranged along the walls of this major exhibition hall show the life cycle of a pine tree and explain how all trees are nourished and grow. Illuminated color transparencies show spectacular stands of important timbers. Forests that flourished in the historical past can be traced and actual sections of

(*Continued on page 8*)

Fossil clubmoss stump

The Periodical Cicada: A Report on Current Field Studies

A periodical cicada, having emerged after many years underground, sheds its old skin and transforms into an adult.

HENRY S. DYBAS
Associate Curator of Insects

SEVEN YEARS AGO, a spectacular emergence of 17-year periodical cicadas occurred in the Chicago area. There is only one population, or brood, of these cicadas in northern Illinois, and hence only one emergence every seventeen years. My colleagues and I took advantage of this infrequent opportunity to make a number of field studies during the few weeks of adult cicada activity. Accounts of this work appeared in the May and August, 1956, issues of the BULLETIN.

During the course of our research, we became deeply interested in the puzzling questions posed by the unusual biology of periodical cicadas. The life-cycles of these insects—17 years in the northern populations and 13 in the southern—are by far the longest in the insect world. In this respect, the periodical cicadas of eastern North America represent an extreme evolutionary development. No reasonable explanation has been advanced to explain why the nymphs (as the early stages are called) should require so long to develop underground. It is a complete mystery.

In 1962, Dr. Monte Lloyd, of the University of California (Los Angeles) and I studied another emergence of 17-year cicadas in Virginia, but until the spring of this year we had never had the chance to work on 13-year cicadas. A 13-year brood was scheduled to emerge in the late spring of 1963 in the Mississippi valley region from Louisiana north to southern Illinois. Moreover, in this unusual cicada year, a population of 17-year cicadas was also scheduled to make its appearance in Iowa and adjacent areas. Such a joint emergence is an uncommon affair which, as a matter of fact, can occur only once in 221 years. Thus it can be calculated that these two broods last emerged jointly in the year 1742 and are not due to appear together again until 2184.

This current joint emergence provided an unusual opportunity for field experimentation. If we brought virgin 17-year cicadas from Iowa and mated them with 13-year cicadas from southern Illinois, would fertile eggs be produced and would live young nymphs result? An answer to this question could be expected in six or seven weeks—the time it takes cicada eggs, which are laid in slits in twigs, to hatch. For this experiment we set up large field cages at the Pine Hills Field Station of Southern Illinois University. The cages were 12 feet high and 12 feet on each side—large enough to enclose small trees on which the cicadas could live and feed naturally. At the time of writing, we already have had positive results. The eggs of

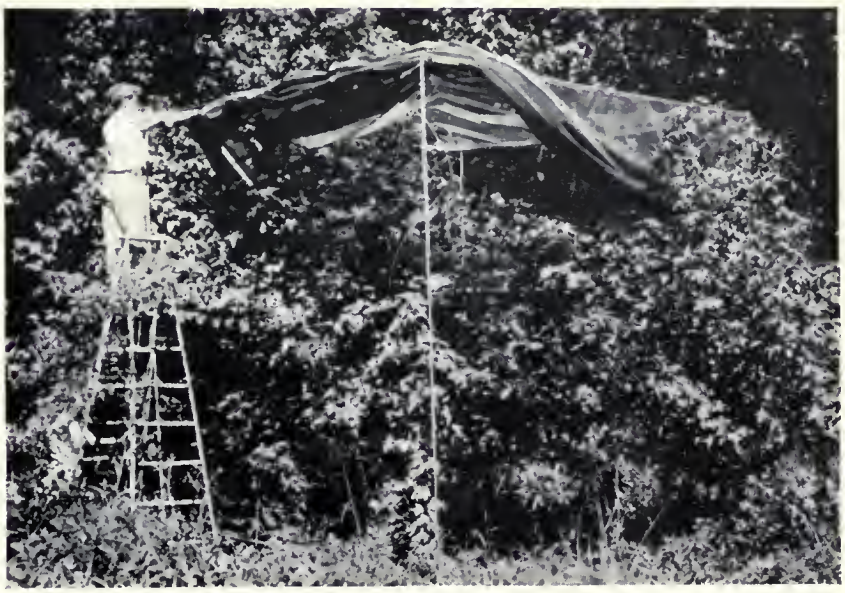
the cross-matings proved to be fertile, and the first-instar hybrid nymphs have successfully hatched and dropped into the soil enclosed by the cages, where they will have living tree roots on which to feed.

Another question we posed has to do with what happens when a 13-year "clock" mechanism is mixed with a 17-year "clock" mechanism. This part of our field experiment is clearly a long-range one with results, if any, to be expected only far in the future. We term it our "long-shot," being fully aware of the natural hazards and vicissitudes which could wash away our effort. We plan to return to the field station to examine the cages from time to time in the coming years. If any cicadas do emerge, will one or the other cycle be dominant? Or will we get intermediate cycles of perhaps 15 years? Most interesting to us, from a theoretical standpoint, would be an incompatibility of the "clock" mechanisms resulting in a complete disruption of synchrony to produce cicadas with entirely new life-cycles. One or another of these possible results would strongly influence alternative hypotheses on the evolution of periodicity and synchrony in these insects.

I have not yet mentioned one of the most astonishing things about periodical cicadas. In spite of a century of intensive work, we have only recently understood that there are three different species of 17-year cicadas, not one. The third species, as a matter of fact, was described only last year by Dr. Richard Alexander and Dr. Thomas Moore of the University of Michigan; yet it is one of the commonest and most widely distributed large, conspicuous insects in North America! With minor exceptions, all three species have the same range. Wherever they coexist in different localities within that range, the three species invariably emerge together. In other words, each species has repeatedly gotten out of synchrony with other members of its own kind in other parts of the range while staying in synchrony with different species in its immediate locality so that they all emerge in the same year. Theoretically, this is a highly unorthodox situation which runs directly counter to a widely held biological principle termed the "competitive exclusion principle." According to this tenet, two or more closely related species that live in much the same way cannot long live together in the same place. The reasoning is that they will compete for some resource, like food or shelter, which happens to be in short supply, and one or the other will eventually win out.[1]

In a cicada year, the insects begin to appear in late May or early June (earlier in the south) and in about five weeks are

(*Continued on page 8*)



A large cage being built over a living tree in southern Illinois. The field experiments described in the accompanying article were performed in such cages.

Distribution of 17-and 13-year periodical cicadas emerging in 1963.

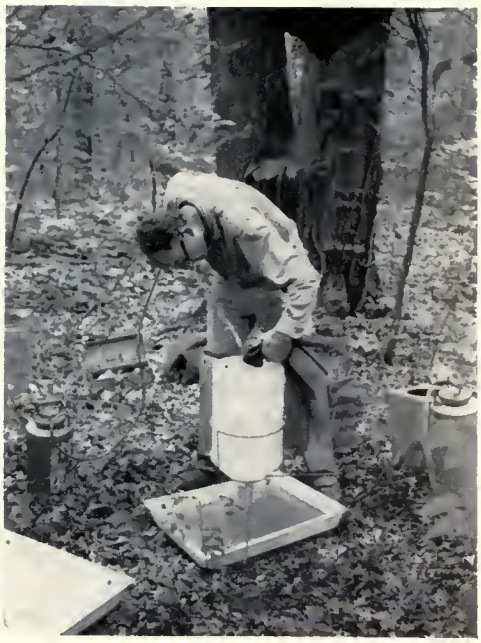
[1] As reported in the September BULLETIN, Dr. Robert F. Inger, Curator of Amphibians and Reptiles, is conducting a two-year field experiment in Sarawak to learn more about this principle.

The Periodical Cicada—

almost all gone. Within this brief period, the males form their large singing choruses and the cicadas court, mate, lay eggs, and die. All the evidence indicates that they are very vulnerable to birds and other predators during their brief life above ground. There is good evidence, too, that birds will annihilate a population that is too small to satiate them. We can now begin to see how periodic emergence, as well as synchrony among the three species, can be of advantage to the cicadas. By emerging simultaneously, the three species—it is believed—function as one species which appears in sufficient numbers to satiate the predators yet still leave a comfortable surplus to propagate the species. If one of these species emerged on some other schedule, it would have to "go it alone" and suffer proportionately heavier losses.

Oddly enough, each of the three 17-year species has a counterpart in the 13-year population. The 13-year forms are largely southern in distribution and all three of its species occurred in our study area of southern Illinois in 1963. They have all been named as separate species, but since they are indistinguishable from the 17-year cicadas except in the way they "count," it is probably better to regard them as chronologic forms rather than as distinct species.

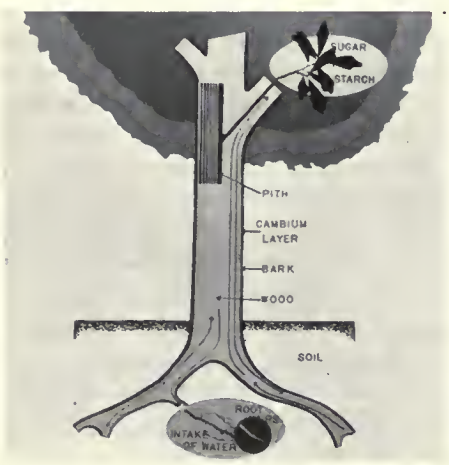
Most of our investigation of these 13-year cicadas this past summer centered on numerical aspects of emerging nymphs, newly hatched nymphs, fertility of eggs, and so on. These numerical aspects are extremely difficult to study in most populations of animals in nature. And yet such research is necessary to understand how, and to what extent, various factors in the environment may influence an animal's success—or, in other words, its numbers. Periodical cicadas, we think, lend themselves to numerical studies. For example, these insects can be censused with an unusually high degree of precision by counting the number of emergence holes per square yard in a mathematically random pattern in a forest. Through such numerical investigations (see also photograph to right) we hope ultimately to gain insight into the processes which resulted in the unlikely mode of life of the periodical cicadas. Perhaps we may even learn something about the way in which animal populations in general are regulated.



Dr. Monte Lloyd recovering tiny newly-hatched cicada nymphs which drop from the forest canopy where the eggs were laid. About 200 trays with preservative were placed in a random statistical pattern in a mature forest to get information on the numbers and patchiness of newly-hatched nymphs "seeding" the soil.

FEATURED EXHIBIT
for October

(*Continued from page 7*)



A portion of an exhibit in Hall 26 showing how trees are nourished and grow

trees from prehistoric eras studied. A central feature of the hall is the large fossil stump of a tree-like clubmoss that lived 250 million years ago.

A special exhibit is devoted to the Dutch elm disease, which threatens the beautiful American elm with the same fate that has already overtaken the chestnut. Scientists, conservationists, and aroused citizens are working together to do everything possible to check the disease, whose origin and spread is explained in the Museum display.

One of the Museum's permanent exhibition areas, the Hall of North American Trees was newly designed and completely re-installed in 1959. It represents the collaboration and work of many persons under the general supervision of the late Dr. Theodor Just, then Chief Curator of Botany. However, Mr. Emil Sella, retired, former Curator of Exhibits (Botany), assisted by Mr. Sam Grove, Mr. Frank Boryca, and Mr. Walter Huebner, must be credited with the design, uniform quality, and excellence of the models and installation.

The hall is located on the second floor of the Museum in the northeast wing of the building.

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Chicago: 365 million years ago

CHICAGO NATURAL HISTORY MUSEUM

Bulletin

Vol. 34 *No. 11*

November *1963*

SOME OF CHICAGO'S Oldest Inhabitants

EUGENE S. RICHARDSON, Jr.
Curator, Fossil Invertebrates

THE HISTORY of Chicago as a busy center of human activity constitutes a record crowded with lustrous names and replete with scenes in every human mood from gentle compassion to raging violence. Broad and varied as is its scope, that history is still only the latest and the briefest chapter in a far longer tale, stretching back through mists of time to epochs almost inconceivably distant.

Long before the city was planted here, long before man came upon its site—even before man made his appearance on this planet—this spot on the earth was inhabited. The record, of course, is not a written one. We see our predecessors, Chicago's oldest inhabitants, through rifts, as it were, in those ancient mists—rifts that may reveal the tooth of a giant beaver in the peaty soil thrown up in ditching, or a fragment of a coral on a quarry floor. These are the fossils, "remains or traces of prehistoric life,"[1] dwelling now in sedimentary deposits.

In the purlieus of Chicago, fossils may be found in rocks of five geologic periods (shown with an accompanying map in Hall 37): Ordovician, Silurian, Devonian, Pennsylvanian, and Quaternary. Within the city itself, however, are only Silurian dolomite (magnesian limestone) and the layers of Quaternary glacial deposits (sand, clay, gravel, peat), lying upon them.

THE QUATERNARY period is the most recent of the divisions of geologic time—in fact, it's still going on. Historians of the earth divide it into two epochs: the Pleistocene, or Ice Age, and the Recent. The dividing line between the two is accepted as lying somewhat more than ten thousand years back. In the last stages of the last of the four incursions of ice across the land, an evergreen forest sprouted and grew near what is now Two Creeks, Wisconsin. The climate was improving, the ice was melting, and the front of the ice sheet was retreating to the north. Then, briefly, things got worse again and the ice pushed south once more. With irresistible force, it ground its way across the Two Creeks forest, knocking down the trees and splintering the logs—and there it stopped. Like the Nazis at Bastogne and the Mongols in Silesia, the ice had shot its bolt; thereafter it melted back and disappeared. Studies of radioactive carbon-14 in the Wisconsin logs show that those trees lived and grew there eleven thousand years ago.

Ancient times indeed! So far back in time was the Ice Age, the Pleistocene epoch, that the very animals and plants were different from those we find in and around Chicago now. Though the plants were chiefly of modern types, their counterparts and descendants now live far to the north. The animals, however, have long since passed from the stage. Teeth and bones of the mammoth and the giant beaver—animals long extinct—have been dug from the glacial deposits in Chicago.

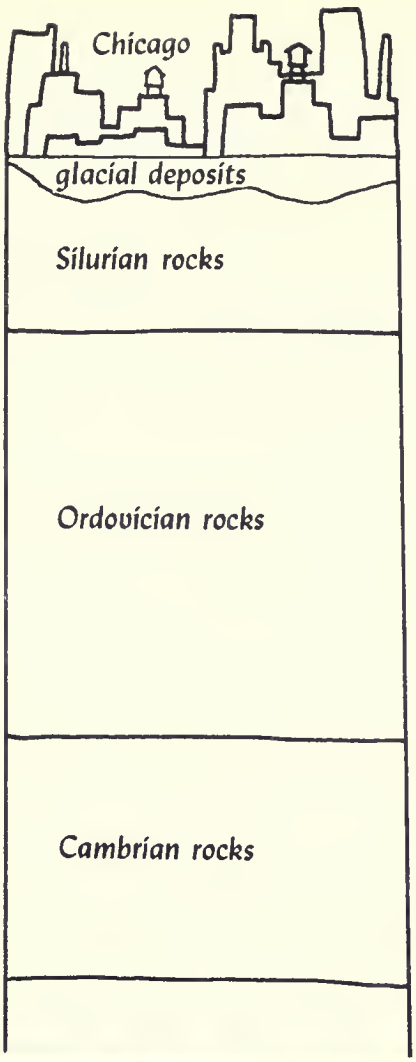
EXCAVATIONS for buildings in the city have shown in remarkable detail what the landscape was like long before the glacial deposits of the Quaternary filled it all in. A system of maturely developed tributaries in broad valleys flowed to the east, into the headwaters of the St. Lawrence River where Lake Michigan is now. The bottoms of these valleys are as much as 130 feet below the present lake level, while the tops of the old hills between them peep through the glacial fill and form high spots in the present land surface. As Professor J Harlen Bretz has said, "Though bedrock is the

most extensive geological feature of the Chicago region and is almost nowhere more than a hundred feet distant from any resident of the metropolitan area, few people in Chicago are conscious of its existence."[2]

But it is in this bedrock, the Silurian dolomite, that we now find the oldest readily available records of Chicago inhabitants. In an exhibit case adjacent to this month's featured exhibit is shown a selection of these predecessors of ours —38 different kinds of them.

Some belong to major animal groups that are still living, such as snails, clams, worms, brachiopods, and corals; others belong to groups entirely extinct, the cystoids, graptolites, trilobites. All are remains of animals that lived 420 million years ago, and are thus 40 thousand times as old as the giant beaver and the mammoth. To cut this large number down to manageable size, 420 million years represents only two and one-tenth revolutions of our galaxy.

Many people in Chicago and vicinity make an enjoyable hobby of collecting Silurian fossils. The number of different kinds is large, the individual specimens are not too bulky, and they are readily found. Here and there about the city, where the bedrock tops of the pre-glacial hills stick out above the surface, there are large quarries, and from these quarries slabs, blocks, and broken pieces of the Silurian dolomite are distributed widely to be used in buildings, road fill, breakwaters, and patios. And with the rocks go the fossils, ready to be found by sharp-eyed collectors.



Left: Like the successive archaeological levels beneath a long-inhabited site, deposits of the geologic past underlie Chicago. Shown at approximately the same scale as the buildings at the top of the drawing are the glacial and Silurian formations, which may be seen at the surface of the city, and the Ordovician and Cambrian formations at greater depth. Underneath these are the metamorphic and igneous rocks that form the greater part of the earth's crust.

Left: *Poleumita scamnata,* one of the Oldest Inhabitants, slightly enlarged. In the Silurian period this snail lived on the edge of a large coral reef.
Right: The most commonly encountered trilobite of our Silurian deposits, *Calymene celebra.* This specimen is a cast of the inner surface of an empty shell, and is shown here slightly enlarged.

Title illustration: Another species of trilobite, *Bumastus niagarensis,* is shown crawling about on coral in this portion of the Featured Exhibit for November. Trilobites were jointed-legged animals distantly related to our lobsters, but are now wholly extinct and are known only as fossils.

Cover: A portion of the Featured Exhibit for November, "On the Site of Chicago: 365,000,000 Years Ago" (Hall 37, second floor, west).

THE FEATURED Exhibit for November shows reconstructions of many of the animal forms that lived on the site of Chicago in Silurian times. Perhaps the first thing about the exhibit to strike the eye is that we are looking at an underwater scene! It is sea water, and we find ourselves on the flank of a coral reef.

This, in truth, was Chicago a couple of galactic turns ago. If we examine rocks and fossils in the rest of the continent, we find that a warm and shallow sea with numerous coral reefs then covered much of central North America from the Gulf States to the Arctic. A map of the Silurian continent, with a very unfamiliar outline, appears in a nearby exhibit case. North America as we know it had not yet assumed its present form. Not only is the continent strange to our eyes, as well as the animals, but the very stars and constellations were different then.

HOW CAN we recognize anything familiar among so much that is strange? The anwer lies in the principle of uniformitarianism, which affirms that physical, chemical, and biological laws do not change through time. "We are thus not prepared to admit, for example, that the physical forces that produced ero-

(*Continued on page 5*)

CHICAGO NATURAL HISTORY MUSEUM

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Members are requested to inform the Museum promptly of changes of address.

IN MEMORIAM

SOLOMON A. SMITH

The Museum sustained a severe loss in the death on October 23 of Mr. Solomon A. Smith, Treasurer and Trustee of the Museum. Mr. Smith had served as Treasurer of the Museum for 49 years and as a Trustee since 1920—his service both as an officer and a Trustee being second only to that of Mr. Stanley Field, Chairman of the Board. As Treasurer, he succeeded his father, Byron L. Smith, who was elected to that position when the Museum was founded in 1893. He is succeeded, in turn, by his son, Edward Byron Smith, Chairman of the Board of Northern Trust Company.

This institution was but one of several which benefited by his service. He had been active also on the Boards of the Museum of Science and Industry, Presbyterian-St. Luke's Hospital, The Chicago Zoological Society, The Chicago Sunday Evening Club, the Chicago Child Care Society, the American Red Cross, and several other cultural, civic, and charitable institutions.

After his graduation at Yale University, Mr. Smith became affiliated with the Northern Trust Company in 1900, and headed that institution from 1914 until his retirement six days before his death. He had served for 30 years as a member of the Chicago Clearing House Committee and was a former member of the Federal Advisory Council of the Federal Reserve System. He was also a member of the Chicago Board of Trade and the Midwest Stock Exchange. He had served on the Board of Directors of a number of prominent business corporations.

He will be remembered for his wise counsel, and for the generous use of his time as a member and Chairman of the Finance Committee, and as a Trustee during the years of the extraordinary growth of the Museum.

PAUL C. STANDLEY

Dr. Paul C. Standley, world renowned botanist and a Museum staff member from 1928 until 1950, died last spring at the age of 79 in Tegucigalpa, Honduras. Since his retirement as Curator of the Museum's Herbarium, he had lived in Honduras, carrying on research at the Escuela Agrícola Panamerica, in El Zamorano, until 1957.

Dr. Standley's death has been mourned by botanists everywhere. He has made a deep and indelible mark on the scientific world through his writings based on years of intensive research and collecting in the field—especially in Panama and Mexico. In 1961, the government of Guatemala awarded him the Order of the Quetzal, which is the highest honor that country bestows on its outstanding leaders.

Before his death, a number of his colleagues, in recognition of his lasting contributions to botany, began preparing a publication in Dr. Standley's honor. Edited by Dr. Louis O. Williams, Curator of Central American Botany, *Homage to Standley* was published by Chicago Natural History Museum last month. One hundred fifteen pages long, the volume is a compilation of papers—about a third of them in Spanish—written by botanists who had worked with Dr. Standley at some time during his long life.

Homage to Standley will be distributed throughout the botanical community and to Dr. Standley's many personal associates and friends in this country and in Central America.

Expedition to Indian Ocean Under Way

Loren P. Woods, Curator of Fishes, will leave November 8 for Bombay, India, to participate in the International Indian Ocean Expedition, a cooperative scientific venture sponsored by the United States Program in Biology and UNESCO. The expedition is scheduled to get under way November 11, and will depart Bombay on a special research vessel, the *Anton Bruun*.

Woods will be engaged in research for the United States Program in Biology, which is particularly interested in collecting animals and plants, other than plankton, that live on the continental shelf and slope bordering the Arabian Sea, and in the midwaters of the Indian Ocean. The Program in Biology was designed by the Oceanographic Committee of the National Academy of Sciences, with the support of the National Science Foundation.

The UNESCO science program combines the efforts of 12 nations in a quantitative survey of the entire Indian Ocean, a project expected to take two years. It will concentrate mainly on oceanographic, hydrographic, and plankton study.

The *Anton Bruun* will chart a course beginning with a short stop at Karachi, Pakistan, and then zig-zagging from near shore to the edge of the shelf through the Gulf of Oman and along the Arabian coast to Aden. The *Anton Bruun*, formerly the presidential yacht, *Williamsburg*, is a 243-foot vessel that has been turned over to the National Science Foundation by the Navy. Exploration will be mainly carried out using trawls and dredges.

In December, at the end of the cruise, Woods will return to southern India to spend six weeks at the Central Marine Fisheries Research Institute at Mandapam Camp. While there, he expects to collect shore fishes and to study Indian Ocean fishes of the order, *Berycoidea*, a group of archaic spiny-rayed fishes.

In early February he will sail from Colombo, Ceylon, on the schooner, *Te Vega*, to various islands of the Maldives and Chagos Archipelagos in the Indian Ocean, planning to reach the island of Mauritius, near Malagasy, by April. The *Te Vega*, a research ship belonging to Stanford University, is another vessel attached to the International Indian Ocean Expedition.

Woods will return to this country via Europe, with stops at several European museums to study fish collections.

SATURDAY FILM-LECTURES

The 1963 fall series of free illustrated lectures, focusing on people and places around the world, continues during the month of November with a program every Saturday at 2:30 P.M. in the James Simpson Theatre. The schedule for November follows:

November 2—Ireland
Alfred Wolff

November 9—Journey to Southeast Asia
Malcolm Miller

This program has been substituted for the one originally scheduled, which has been cancelled because of illness.

November 16—Hungary and Bulgaria Today
Ralph Gerstle

November 23—Designs for Survival
William A. Anderson

November 30—France
Ed Lark

(*Museum News continued on page 8*)

CHICAGO'S OLDEST INHABITANTS

(*Continued from page 3*)

sion in Pennsylvanian time acted on a principle different from the one on which they act today; or that the germ plasm was not involved in genetic changes prior to the Jurassic . . ."[3] Warm, shallow, limy seas permit the deposition of carbonate rocks (limestone and dolomite) today, and so they did in Silurian time; the germ plasm with its genetic code was transmitted then as now from one generation to the next. If a Silurian animal is unfamiliar at first glance, we have but to follow the spectrum of its descendants to observe the continuity of life from Then to Now, or to trace the animal back to some common ancestor from which the trail of parent to offspring, endlessly repeated, leads to forms now living. Change is as inherent in life as constancy, and when physical conditions become strenuous, established forms may perish; but life continues and some variant form that occupied an obscure niche before is now favored in the contest and becomes the ancestor of coming generations.

The description of all animal types that have lived is still incomplete and will probably be forever so, but paleontologists—at this Museum and at hundreds of other institutions—continue to study the fossil record and to fill in the gaps. Incomplete though the story of ancient life is, the principles of its plot are becoming known, and we can recognize in these oldest inhabitants of Chicago early characters in a continuing tale.

[1] See exhibit, "These Are Fossils," at the east end of Hall 37.

[2] Bretz, J Harlen, *Geology of the Chicago Area, Part 1.* Illinois Geological Survey, Bulletin 65, Part 1, (1939), page 60.

[3] Zangerl, R. and Richardson, Jr., E. S., *The Paleoecological History of Two Pennsylvanian Black Shales.* Fieldiana: Geology Memoirs, Vol. 4 (1963), page 4.

The Legend of Willow Ware

Wanda O. Harrison, Department of Zoology

One of the puzzles encountered while investigating the role of the swallow and willow in Chinese art concerned the origins of the willow pattern on chinaware and the story connected with it. Is this pattern really a Chinese picture story illustrating a Chinese legend, as some authorities have held, or is it a Chinese-inspired design with an Occidental story added, as other authorities maintain? The design has amazingly little written history, the story even less, and one might think that the scanty evidence was all in and weighed. Investigation proved otherwise, for thanks to the availability of research materials in the fields of anthropology, botany, and zoology at Chicago Natural History Museum, a new approach to the problem was possible. This previously unexplored avenue of investigation centered on Chinese sources relating to the symbolism of the birds and trees that appear in the design.

The willow pattern, as it has become conventionalized, usually shows a large house set amid flowering trees; a willow, which gives the pattern its name, with two birds fluttering above; a bridge with figures on it; a boatman on the river; and islands in the distance. The associated story is that of a mandarin's daughter who fell in love with her father's secretary and, despite being betrothed to an older official, eloped with her young lover. The pair eluded pursuit, were married, and lived happily until discovered. Then they perished in a fire that was set in vengeance, whereupon the gods in pity turned them both into immortal doves, as a symbol of the lovers' constancy.

The willow pattern was named and mass-produced first by Thomas Turner, of Caughley, England, in about 1780. Because of its unrivaled success, it was widely adapted by other potteries. This resulted in many variations in details. The pattern caught the public fancy as no other ceramic design has done, for the blue color (for which the demand was greatest) was bright and attractive, the design was decorative, and the story that became attached to it made it a conversation

Right: Drawing of the birds called "doves" in the modern willow pattern story.

Left: Green jade screen (early 20th century) on exhibit at Chicago Natural History Museum shows two ladies playing flutes, two swallows flying overhead, and a willow tree framing the scene. An example of the modern use of the traditional combination of swallow and willow.

piece. Its early popularity undoubtedly was due to the contemporary vogue for things Chinese, which was a development of the Chinese export trade that began in Europe in the 16th century and was at its height during the 18th century. Chinese influence had its strongest impact on the decorative arts, particularly in the field of ceramics.

The design of the willow pattern seems to have been drawn from traditional Chinese landscapes. Known as *shan shui*, or "mountain and water" pictures, their characteristic elements are houses, pavilions or temples nestled among trees, birds flying about in pairs or in flights, in the foreground a fisherman in a boat or a traveler crossing a bridge, with islands and mountains in the distance. These became known in the West as "island," "bridge," or "river" designs. The willow pattern combined several elements of these typical landscapes.

While the willow pattern is a Chinese-inspired design, the view that it depicts a Chinese story is not convincing to anyone familiar with Chinese ideas and customs. Rather, the story seems Occidental for the following reasons: (a) lack of documentation traceable to Chinese sources, (b) the identity of the birds, (c) the symbolism of the birds, and (d) the symbolism of the willow.

No Chinese source has ever been offered for the legend on which the story of the willow pattern was supposedly based. The earliest publication of the tale seems to have been in an English periodical of 1849; it is this account, given in elaborate detail, that has been briefly summarized above. There are also several rhymes associated with this pattern, one of which, from Staffordshire and supposed to have been current in the 19th century, is as follows:

Two pigeons flying high,
Chinese vessel sailing by,
Weeping willow hanging o'er,
Bridge with three men—if not four.
Chinese temple, there it stands,
Seems to cover all the land,
Apple tree with apples on,
A pretty fence to end my song.

Subsequent versions of the story appear to stem from these early English accounts.

While the birds are identified as doves or pigeons in these stories, an examination of a number of examples of willow-ware shows that the birds actually have the long, forked tail and the long, pointed wings characteristic of certain swallows common to China, England, and America. There is nothing sufficiently dove-like in the drawings to offset this identification. Swallows, identified as such in Chinese sources, often appear in Chinese designs. It seems safe to assume that swallows served as models for these conventionalized birds.

The symbolism of both the "doves," and the willow, as used in the story, does not accord with Chinese ideas and customs. The use of the dove as an emblem of constancy is an Occidental idea: in the West this bird long has been associated with the god of love and is a familiar element among wedding symbols. In China, however, while certain birds are used to represent marital fidelity and constancy, pigeons and doves are not among them. Moreover, in the story the willow carries the implication of sorrow, and this idea also is more Occidental than Chinese. The willow is often alluded to in the West as the tree of sorrow, as in the phrase, "wearing the willow," and is an emblem of desolation and desertion. But in China, while occasionally the willow may be used to evoke

(*Continued on next page*)

Below: Illustration of swallows and willow used to introduce a chapter in the Chinese encyclopedia **Chin-ting ku-chin t'u-shu chi-ch'eng.** *This very important work, compiled under Imperial auspices, is a comprehensive, classified compendium of illustrations and material from books covering the period from ancient to modern times. The copy in Chicago Natural History Museum is an 1884 edition. The original edition appeared in 1728.*

This encyclopedia is one of the Chinese sources drawn on for the material in this article, which is part of a larger work on the swallow in Chinese life and art now in preparation.

Contemporary blue and white willow pattern plate.

the sadness of parting, this tree usually inspires thoughts of spring and youth—the verdant, vibrant time of life, with its corresponding feelings of pleasure and enjoyment.

Enough has been said to indicate that the so-called willow pattern story is not Chinese, but Occidental. No such story seems to have been attached to willow pattern ware at the time it was first produced in England. The tale appears to be an English invention, perhaps created for someone's amusement or to promote the sale of the chinaware decorated with this pattern. There are now as many versions of the "legend" as there are of the pattern.

But the picture does have a symbolism in Chinese culture, and a story can be read from it but one quite different from the Occidental tale.

In Chinese art it is customary to show birds in the environment in which they belong: a particular bird is invariably drawn with a particular flower or tree. This recalls the early arrangements of Occidental artists such as Audubon who specialized in drawing birds in nature. Thus the combination in a landscape of the swallows that feed over streams and ponds and the willows that grow along their margins would be natural.

Every Chinese family welcomes the swallow, since it is thought to be very lucky to have a pair of these birds build a nest near a house. The swallows are usually shown in pairs, for according to the Chinese that is the "nature" of the bird. "Two flying swallows" is a phrase symbolic of a happily married couple, and swallows have come to be emblematic of marital constancy and good luck. A good omen, the swallow appears in some of the earliest myths and legends as a symbol of fertility. It is also associated with marriage and birth rites, the longevity cult, and appears in the Chinese *materia medica*.

The willow is one of the most popular trees in China and is seen everywhere, clustered about houses in towns and villages or along the banks of streams and ponds. Valued for its usefulness as well as its attractiveness, the willow typifies pliancy and softness. It has special meanings for the Chinese in connection with feminine traits and attributes: a slender waist is "willowy"; arched eyebrows are "like a willow leaf."

The association of swallow and willow is a traditional one among the Chinese and has particular significance for them. A favorite subject in art and poetry, the combination of swallows and willows signifies spring. The double motif also implies the change of seasons from spring to summer, and thus alludes to the passage of time in human affairs. Together, the graceful flight of the swallow and the delicate sweep of willow branches suggest beauty and elegance. Another meaning attributed to this combination is companionship. The swallow is gregarious and friendly, and the willow growing in the courtyard of the house seems like a close companion. Also, in the earliest Chinese literature the swallow is used with meanings of ease and comfort; the willow with restful, tranquil feelings, shade, and an invitation to rest.

Thus, in Chinese symbolism, the traditional combination of swallow and willow in the willowware pattern evokes a mood of good fortune, companionship, grace, beauty, rest, ease, and tranquillity. Considered against this background, the reading of a tragic love story into the design seems to be an example of literary chinoiserie—an English product to satisfy an 18th century English taste for things Chinese; an English idea grafted onto a Chinese design.

(The author of the above article began the study of Chinese culture in 1931, working independently under the late Dr. Berthold Laufer, former Chief Curator of Anthropology at the Museum. A graduate of the University of Chicago, Mrs. Harrison has been a Research Associate with the Art Institute of Chicago, a translator for the War Department, a Research Analyst for the U. S. Board on Geographical Names, and served with U.N.R.R.A. in Shanghai. She has studied Chinese collections in museums in the United States, Canada, Honolulu, Shanghai, Hong Kong, and Manila, and is the author of several articles in her field of research.)

(Continued from page 5)

BOTANICAL PRINTS ON DISPLAY

A collection of about 40 linoleum block prints of botanical subjects was placed on exhibit in Stanley Field Hall at the beginning of November. The prints are the work of Wisconsin-born Henry Evans, now a resident of San Francisco where he operates a bookshop dealing in rare books and manuscripts, and also a printing press.

Some eight years ago Evans tried cutting wood blocks as an approach to the problems of printing the work of others. Five years elapsed before he produced work that he was willing to show. Now, using a Washington Hand Press built by Hoe about 1852, linoleum blocks of his own design and cutting, hand-made papers, and imported inks that he carefully mixes for each subject, Evans produces prints that are distinguished by excellence of design and execution. His sensitive and accurate delineation of the essential form and character of plants is a product of careful observation on frequent excursions when, likely as not, sketches of a chosen subject will be made directly on a linoleum block.

Examples of recent work, printing blocks, and the tools used are on exhibit.

PRINTED BY CHICAGO NATURAL HISTORY MUSEUM PRESS

CHICAGO NATURAL HISTORY MUSEUM
Bulletin
Vol. 34 No. 12
December 1963

Stuffed toys from Old China.

From the Museum's new exhibition hall, "China in the Ch'ing Dynasty (1644-1911 A.D.)," opening in January.

The hall portrays everyday life under the last Emperors of China.

January: The Midwest

A New Holiday Exhibit

JANUARY

Through the Latitudes

AUSTIN L. RAND
Chief Curator, Zoology

IN 1962 I prepared for the BULLETIN a two-page picture story of January's seasons through the latitudes: from the Arctic, through the Americas, to the Antarctic. Now we have prepared a five-case exhibit illustrating the same idea and have installed it in the Albert W. Harris Hall (Hall 18).

When it is wintertime in Chicago it is summertime in Buenos Aires; when it is winter in the Arctic it is midsummer in the Antarctic even though the austral summer of the Antarctic looks as cold and snowy as Chicago's boreal winter. Halfway between is the tropics where winter never comes and it is summer all the year.

January: The Amazon

(Paintings by E. John Pfiffner)

Thus January is midwinter in Chicago when the daylight hours are fewer, the weather coldest, and plant and animal activity at a minimum. But January is midsummer in Buenos Aires and daylight hours are longer, weather warmest, and plant and animal life at a maximum. Thus January in Buenos Aires is the seasonal equivalent of July in Chicago.

These seasons are caused by the tilt of the earth on its axis in relation to its orbit around the sun. During nearly half the year the northern hemisphere is tilted away from the sun, receives less heat from the sun; and this gives winter there. At the same time the southern hemisphere is tilted toward the sun, receives more heat; and this gives summer there. Conditions are reversed, of course, at the opposite time of the year.

(*Continued on page 8*)

Bible Plants and Animals

Annual Holiday Excursion

Bulrushes. Illustration from "Bible Plants"

THE HABITAT group, "Marsh Birds of the Upper Nile," located in Hall 20 on the Museum's first floor, displays clumps of bulrushes growing thickly along the mud banks of the river. Bulrushes are one of the many plants mentioned in the Bible; it was, for example, in an "ark" of bulrushes that the daughter of Pharaoh found the infant Moses. The exhibit is one of several in the Museum which show plants and animals of the Bible. Each year, a self-guided tour of these exhibits is offered as a holiday feature.

Adding an important dimension to the tour are two Museum publications, one on *Bible Plants*, the other on *Bible Animals*. Written by Marie Svoboda, the first of these Raymond Foundation Storybooks relates how bulrushes were used in Bible times not only to make boats, or "arks," but also mats, clothing, sandals, and baskets. The most famous use of the bulrush, however, was in paper making. Most of the writings preserved in Egyptian tombs were on papyrus, the name by which the bulrush plant is perhaps better known.

Other plants whose histories are related in *Bible Plants* are the Cedars of Lebanon from which Solomon's temple was built; the palms whose branches were spread before Jesus on Palm Sunday; the olive trees in the Garden of Gethsemane; the fig tree that provided a perch for Zaccheus; the "rose of Sharon," the "lilies of the field," and the richly laden vines of the Promised Land. Many of these plants are featured in the Museum's holiday "excursion."

Written by Maryl Andre, *Bible Animals* records how lions and serpents, dugongs and corals, and many other living creatures, were important to the peoples of the Bible. Most of these animals, too, are seen on the holiday tour. A final chapter in the Storybook describes the animals used by biblical writers to illustrate traits of human character.

Directions for the self-guided tour of "Bible Plants and Animals" may be picked up free of charge at the Museum entrance doors or at the information desk in Stanley Field Hall. The two booklets can be purchased at the Museum Book Shop for 25 cents each.

Birds of the World

Paintings by Karl Plath

BIRDS of the world, captured on canvas by the well known ornithologist and painter, Karl Plath, will be displayed in Stanley Field Hall December 14 through January 20, as one of several special exhibits to be presented during the holiday season.

The paintings are notable for their life-like quality, a reflection of Plath's life-long study of birds. For 25 years, until his retirement in 1960, Plath was Curator of Birds at Brookfield Zoo. He has traveled thousands of miles to collect, study, and sketch birds in many parts of the United States, in Bermuda, the West Indies, and in Australia. For many years he also kept a private aviary which housed more than 400 species.

Karl Plath's paintings have been shown in eight of the annual exhibitions of Chicago artists, and at the Art Institute of Chicago. A traveling exhibition of his canvasses has toured major Eastern and Midwestern museums. A number of Chicago galleries have arranged one-man shows of his works. In 1962, Plath was elected a Fellow of the Royal Society of Art in London.

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William A. Fowler

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IN MEMORIAM

Alfred Lee Rowell

1894—1963

In 1939 the Department of Anthropology decided to install a new hall, the exhibits of which would illuminate the various prehistoric Indian cultures of the New World. We decided among other things to use dioramas to vivify certain aspects of some cultures.

In 1940, I visited the museum at Mesa Verde National Park and was struck with the beauty, precision, and artistic qualities of the five dioramas on display. They represented in reality that which we had dreamed of having on display. Upon inquiry I learned that they had been created by Mr. Lee Rowell, artist, who was then employed in San Diego as a civilian engineer in the Army. My colleagues and I decided that Rowell was the artist we had been searching for. After a delay of several months, Mr. Rowell joined our staff on April 21, 1941. Never has there been a better or happier selection of a staff member. Never have we regretted our decision, for until the day of his death Mr. Rowell was a valued member of our staff.

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Cover photograph by

John Bayalis and Homer V. Holdren

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STONE CHIPS TELL A TALE

In early October of 1962, George I. Quimby, Curator of North American Archaeology and Ethnology at the Museum, and James R. Getz, Chairman of the Advisory Board of the Illinois Archaeological Survey, were exploring the northern shoreline of Lake Michigan for traces of settlements occupied by Indians before the coming of the white man.

Their search was not a haphazard one. Previous experience had already led them to discount several factors that might ordinarily have determined the location of prehistoric settlements. For example, the Indians could have obtained drinking water from the lake itself, so Quimby and Getz did not need to search for an inland spring or stream. Food, also, had probably been equally abundant throughout the region. Along the lake's rugged shoreline, however, a few good beach areas stood out, marking locations that would have made easy landing places for canoes. In these areas, and these only, Quimby had learned, Indian sites might be found.

At the head of an unnamed bay jutting out from Michigan's Upper Peninsula the two men sighted such a beach—the only good landing place for a canoe for several miles in either direction. Quimby and Getz examined the area fully expecting to find a Late Woodland or Historic Period Indian site. Exploring behind the shoreline, they were able to discern the outlines of an archaeological deposit measuring about three feet wide and five long, and buried beneath some six inches of sand. At the edge of this area were several patches of charcoal, evidently the remains of a hearth.

Using trowels, the two archaeologists dug a small trench across the deposit. To their disappointment, the dig yielded only crude flint materials that at first glance did not even seem to be the product of human activity—yet had to be, because flint cobbles and fragments could not occur naturally in this sandy area some distance from the shore. They began, therefore, to collect the fragments of flint they had uncovered. This, in itself, was an unusual procedure. In collecting artifacts of chipped stone, archaeologists are ordinarily interested in those that were clearly used as tools; the chipped cobble fragments and cores which are the by-products of tool-making are largely ignored. It has long been recognized that an understanding of the ways in which tools were made is of prime importance in reconstructing the social customs of extinct peoples. It was Quimby's theory that the stony residues discarded in the tool-making process might yield equally important insights into extinct cultures.

About a thousand fragmentary artifacts from the bay site were brought back to the Museum, and a detailed analysis of them undertaken by Quimby in collaboration with Dr. Lewis R. Binford, Assistant Professor of Anthropology at the University of Chicago. The debris studied consisted of flint cores and spalls, discarded after the Indians had chipped from them the blank forms from which the finished tool would be fashioned; and there were also hundreds of stone pieces chipped from the cobbles in the process of obtaining blank tool forms.

It was Quimby and Binford's task to classify the types of cores found according to the various methods of flint chipping that had produced them, to identify the blank forms which the Indians had selected for producing various types of tools, and to relate each kind of stone fragment found on the site to a particular step in the manufacture of these tools.

As other northern Lake Michigan localities were explored, there were times when Getz and Quimby were concerned about the amount of stone "junk" they were bringing back to the Museum. The extra effort to collect not only tools but the residues of the tool-making process paid off handsomely, however, when Dr. Binford discovered that the Late Woodland Indians occupying the bay site and three other localities had used a flint chipping technique that was, before his study, completely unknown to archaeologists.

The Museum has recently published Binford and Quimby's report on the discovery. "This technique," the authors state, "is a very distinctive type characterized by the production of small nuclei . . . produced by the placing of small pebbles on an anvil and directing a blow parallel to the vertical axis of the pebble"[1] (see title drawing). It is a crude, poorly controlled method of working stone, the authors conclude, which may possibly represent a way of making use of small, flat pebbles by Indians who also employed more elaborate techniques.

What have Quimby and his colleagues learned about the Indians who left traces of this unusual method of tool manufacture? Statistical and comparative evaluations have been made of the quantities and kinds of artifacts found on each site explored. As a result, it is now possible to reconstruct some of the life activities

P. R. NELSON

of the extinct peoples who occupied Michigan's Upper Peninsula from about 1000 to 1600 A.D. These Indians spent the summer months in villages scattered along the northern shores of the lake. The sites of eight of these villages are currently known. To these settlements, which were invariably located adjacent to good landing beaches, the Indians traveled by birchbark canoe. One of the shore sites studied—the bay location discovered by Getz and Quimby—was not a village, but rather a flint knapping station where the first step in the manufacture of tools took place. Here the Indians beached their canoes, selected flinty cobbles from the lake shore, moved back from the water to the top of an old beach, and built a fire. Using a crude, aberrant technique, they struck from the cobbles the blanks needed for making tools. Taking these forms with them, the Indians returned to their villages. There, archaeological evidence reveals, they completed the final fashioning of the blanks into projectile heads.

This reconstruction amply supports the value of studies based on fragmentary stone debris. The authors of the Museum publication stress "that these insights into the activities and occupational histories of the prehistoric sites examined could not have been gained through a conventional approach that was concerned only with tools and other finished artifacts."[2]

[1]Binford, L. R., and Quimby, G. I., "Indian Sites and Chipped Stone Materials in the Northern Lake Michigan Area." *Fieldiana: Anthropology*, Vol. 36, No. 12: August 29, 1963, page 277.

[2] Ibid., p. 306.

HOLIDAY GIFTS OF DISTINCTION

Personally Autographed

BOOKS

For the Armchair Shopper

During the Holiday shopping season, popular books on a variety of natural history subjects, written and autographed by members of the Museum's scientific and scholarly staff, may be ordered by mail from The Book Shop. Your selection can be gift wrapped and shipped directly to any address.

FOR ADULTS

A Midwestern Almanac

By Austin L. and Rheua H. Rand $4.85

"It is a pleasure to read a nature book devoted to the Midwest. . . . The authors have taken the story of a year as it follows the course of the sun, and, because there is really no beginning or end to a year, only an endless spiral of time, the book itself may be picked up and read at random."—*The Chicago Tribune.*

Birds of Mexico

By Emmet Reid Blake $9.00

The only complete guide to the field identification of Mexican birds. This volume covers all of the 967 species and two thousand-odd geographic varieties that are so colorful and interesting a part of the Mexican landscape.

Indians Before Columbus

By Paul S. Martin, Donald Collier, and George I. Quimby $9.00

Selected for the White House library, repository of the finest in American writing, this book has earned a place as one of the most popular and respected classics in its field. Twenty thousand years of Indian history, as revealed by archaeology, are unfolded.

Indian Life in the Upper Great Lakes

By George I. Quimby $3.25

"Quimby's book tells this history of an environment, peoples, and continuity of cultural traditions with clarity and directness. His work has the fine and deceptive simplicity of the mastered subject, well-loved by its author."

—*Science*

Living Reptiles of the World

By Karl P. Schmidt and Robert F. Inger $13.00

A handsome volume illustrated with superb photographs in color and black-and-white, providing a panoramic view of the reptilian world. It incorporates the scientific research necessary for a thorough understanding of reptiles, yet can be read and enjoyed by everyone. Reptiles and amphibians are revealed as some of the earth's most fascinating creatures.

Practical Taxidermy

By John W. Moyer $4.25

"One of the very few books written on this subject, it explains the art of taxidermy in a clear and concise manner. A valuable guide to amateurs."—*Science Service*

Trophy Heads

By John W. Moyer $17.00

Here is a compilation of everything the hunter needs to know about the game animals commonly sought as trophies. Informed advice is also offered on the guns to use in going after each game animal. The author has hunted in many areas of the world, including India.

FOR YOUNGSTERS

Two books in the *Encyclopaedia Britannica* "True-to-Life Series." Each is profusely illustrated with color photographs.

Birds in the Summer

By Austin L. Rand $1.20

Life Along the Seashore

By Alan Solem $1.20

All prices include tax and postage.

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JANUARY

THROUGH THE LATITUDES

(*Continued from page 2*)

This alternation of the seasons is a very difficult idea to put across. That seasons differ with space as well as with time should become part of our global thinking. By old style travel, train and ship, it took days and weeks to get from boreal winter to austral summer. Now the duration of a plane trip is quoted in hours, not days! Older people whose thinking is geared to earlier transportation ideas may find the transition to global thinking especially difficult. But younger ones growing up accept the fact that they can leave Chicago today and be in Amazonia tomorrow, and the next day in Buenos Aires, and that an astronaut can circle the globe several times in a day.

In the exhibit each of the five cases is devoted to one of the five zones: Arctic, North Temperate, Tropical, South Temperate and Antarctic Zone. Each case has in the upper left a painting showing a January scene appropriate to the zone depicted, and explanatory charts and text. The rest of the case is devoted to specimens, animal and plant, and artifacts.

The material has been selected to keynote each season: Eskimo skin clothing and a polar bear pelt, fur and whiteness dominate the Arctic January; leafless branches, dead weeds, snow and hibernating mammals the North Temperate screen; lushness, greenery, and color, fruiting and flowering, the Tropics; growing green and breeding birds the South Temperate; and snow and ice and penguins the Antarctic scene.

This exhibit is an attempt to portray broadly the conditions under which life is lived at these five, widely separated, selected localities on the globe. As such the specimens are not labeled as to specific identity, nor is the selection comprehensive. The Tropical case is cluttered with diverse objects, the Antarctic one is rather bare with few specimens, thus reflecting life and conditions in each zone.

For those who want to know more about the life of these zones and the identity of the specimens, a guide is provided to exhibits in other parts of the Museum where such information can be found. This guide, a marked floor plan of our exhibit halls, is placed in a glass topped table case in front of the exhibit.

In addition to the message this exhibit presents, "January Through the Latitudes" merits attention from another point of view.

This new exhibit is another experimental one, along the lines of the "Winter and Summer: Fur and Feathers" exhibit we showed two years ago. It is an attempt to use traditional museum material to present ideas in a different way. Most of our zoology exhibits present the material with one of two aims, either (a) to illustrate the wealth and diversity of animal life in an orderly way, i.e., a systematic series, or (b) to show the animals in natural settings in habitat groups.

In systematic series the animals are classified by relationships, the most closely related species being placed next each other. One result is to have a hall of birds, another of fishes, etc. In habitat groups the visitor sees replicas of the countryside in which the animals live; these are usually grouped by continents: an African hall, an Asiatic hall, etc. In the preparation of both systematic series and habitat groups the main emphasis is on authentic natural appearance, a detailed duplication of the real objects as they appeared when alive.

Both of these types of exhibit have their place, and important ones. They provide the only source for our more than a million annual visitors to see the range of the animal kingdom and the diversity of nature around the globe. Our halls truly provide windows of the world.

But important, too, are the study skins and other preserved specimens which form the scientific collections housed "behind the scenes." These, vastly more numerous than the specimens on exhibition, provide the material which the research scientists "read" and interpret.

We have provided a way for our Museum visitors, also, to "read" these scientific specimens. The visitor must correlate the data read from the specimens with climatic and geographical data read from the paintings, charts and labels in the case. This gives him the story he carries away with him.

Another aspect of this exhibit on "January Through the Latitudes" is that it is less permanent than a habitat group, for instance. The preparation of the material is relatively quick and easy, and the number of ideas to be read from the specimens are infinite. Flexible, diagrammatic exhibits such as this new one may enable us more frequently to present themes that can open new lines of thought when looking at animals.

WINTER JOURNEY

The new exhibit described on this page is the first stop on the current Raymond Foundation Journey, "Winter Through the Latitudes," which is in effect from December through February. Complete "travel" directions for the new Winter Journey may be picked up at the Museum entrance doors. They will direct youngsters and their families to many exhibits showing life in different climatic zones. Among these are habitat groups of the Antarctic penguins, Arctic Eskimos, the rhea of the South Temperate Zone, and the many colorful birds of the Tropics. Boys and girls will enjoy studying each exhibit to find answers to a number of questions included on the Journey direction sheet. Filled-in questionnaires should be signed and dropped in the barrels provided near the entrance doors, so that the youngster may receive credit in the Museum's regular Journey program for children.

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